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for Flattened Strand (Type B & G)	30 times diameter of rope
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for 6 x 19 Filler Wire	26 times diameter of rope
for 6 x 22 Filler Wire	23 times diameter of rope
for 8 x 19 Warrington	21 times diameter of rope
for 8 x 19 Filler Wire	21 times diameter of rope
for 6 x 37 Seale	18 times diameter of rope
for 6 x 41	18 times diameter of rope

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The Oil Man's Calendar

MAR.	
5	American Petroleum Institute, Illinois Chapter, Evansville, Indiana.
10	American Petroleum Institute, Los Angeles.
23–25	American Society of Mechanical Engineers, Houston, Texas.
26–27	American Petroleum Institute, Mid-Continent District, Tulsa.
APRIL	
9–10	American Petroleum Institute, Eastern District, Pittsburgh.
16–17	National Petroleum Association, Cleveland, Ohio.
21–23	Southwestern Gas Measurement Short Course, Norman, Okla.
21–24	American Association of Petroleum Geologists, Denver, Colorado.
22–24	Petroleum Industry Electrical Association, Shreveport, La.
MAY	
13–15	Natural Gasoline Association, Mayo Hotel, Tulsa.
	A.P.I. Mid-Year Meeting Canceled.
27–28	Interstate Oil Compact Commission, Little Rock, Arkansas.
NOV.	
9–13	American Petroleum Institute, Chicago.

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The Changing Panorama

OPC Reverses Itself With March Quotas

ALTHOUGH the third month of the year will bring the third consecutive and sharpest reduction in production rates, because of better distribution of allocations between states, March quotas issued by OPC represent material improvement over those of the two preceding months.

Threatened dislocation of the industry as a result of previous OPC attempts to establish allowables on a basis of crude reserves, thus frequently boosting output in areas where oil was going to storage and reducing production in some territories that were drawing on stocks, has been corrected to a large extent by the March quotas.

(THE OIL WEEKLY *called attention to the pitfalls ahead if OPC continued to use the reserve basis for crude production allocations without regard to other important factors in an article, "State Production Rates Must Be Adjusted With Care" published February 16, 1942.)*

The principal March changes were in Oklahoma and Texas, areas most in need of adjustments. Oklahoma, where stocks were drawn upon for 1,539,000 barrels, or 32,214 barrels daily during the first seven weeks of the year, received a 10,000-barrel increase. This returns the state to a level which production in January indicated it could produce. Texas' quota was reduced 84,500 barrels daily, which is as it should have been for here stocks had risen 5,736,000 barrels or 117,000 barrels per day since the turn of the year and pipeline proration had been instituted. The preceding two months had seen Texas' allocation boosted sharply (up 93,800 barrels in January and 22,500 barrels in February) although much oil was going to storage.

Illinois was trimmed further, which because of its strategic location in supplying the East Coast at first seems peculiar, but is well explained by the state's inability to produce its allocation. The state's new level is still above its actual producing rate, and thus leaves room for any increase that might possibly be achieved.

Kansas, which protested previous reductions, was further cut. And now that its early year trend of adding to storage has been changed to a situation where small drafts on inventories are being made, this will create sharp criticism.

Louisiana, New Mexico and California, where oil has been going into storage, were adjusted downward.

Naturally the third consecutive reduction comes as a disappointment, but since the nation as a whole has been adding to stocks this is something that had to come. During January a daily average of 225,000 barrels went to storage, and the first two weeks of February saw this rise to 265,928 barrels. Consequently, the recommended March reduction of 105,000 barrels will help relieve the storage situation. March's quota is 142,200 barrels below December.

• • • *Do not be surprised if you are called upon to furnish an inventory of your oil country equipment on hand preparatory to a move which will require companies with heavy stocks to give up a part of their supplies to other operators less fortunate.*

A Needed Revision

REWORKING of wells has been brought to a near standstill by provisions of M-68. Especially is this true in such instances where some new piece of equipment may be needed, as in plugging back to an upper producing horizon, which because of the spacing of most wells requiring workovers make it necessary to obtain exception approvals.

Here is a situation where additional oil can be produced with the very minimum of steel, perhaps only a new screen and packer. From any angle the situation is viewed, it seems opposed to the most desirable end. Many wells are likely to be abandoned that could be saved by plugging back a few feet to relieve the water situation, etc. Something should be done that will promote instead of retard work that will save a well or make additional oil available with minimum quantities of steel.

A New Transportation Facility Booming

THE increased movement of petroleum on inland waterways has been phenomenal. Nearly 200,000,000 barrels will be moved on the more than 5000 miles of the Mississippi Waterways Systems during 1942, thus helping to release tank cars and pipe lines for use in supplanting tankers delivering products to the East Coast. This total will be more than four times the less than 50,000,000 barrels moved in 1933.

Inland barge movements get most of their supplies from refineries along the Texas and Louisiana Gulf Coast, where almost one fourth of the country's refining capacity is concentrated. Petroleum now moves by barges from Corpus Christi, Houston, Beaumont, Port Arthur, Lake Charles and New Orleans up the Mississippi River to the Missouri, Illinois, Tennessee, Cumberland, Ohio, Allegheny, Monongahela, and other navigable contributary rivers of the Mississippi system. Thus oil is being moved by barges to points 100 miles above Pittsburgh, to Charleston, West Virginia, to the Great Lakes, to Iowa and Nebraska, to Minneapolis-St. Paul and other large inland cities.

At the end of 1941 the Board of Engineers listed 252 oil barge terminals at 135 points in 17 states on the Mississippi system. Two years before, in 1939, only 160 oil terminals were reported.

Consequently, a new and extensive oil water shipping system is being built up. It will continue to play an important role in the distribution of petroleum products even when peace again returns.

Air-Raid Barricades

SO the ever-widening use of petroleum products for war purposes, is added that of mixing asphalt with sand in constructing barricades against air-raid damage. Important buildings in San Francisco are being protected with this type of barricade.

The sand-asphalt mixture is high-

ly resistant, can be tamped into place easily, but unlike straight sand barricades will remain in place undisturbed even if the burlap sacking completely rots away.

A very small amount of asphalt cement, about 3 percent, is mixed with fine sand. The mixture is heated with regular asphalt-heating equipment, and can be sacked by a two-man crew at the rate of 200 bags an hour. The sacks are filled only to about 60 percent capacity, so plenty of free play is left for tamping into stable position in the barricade.

Where Can Man Serve Best?...Our Problem

WHERE will the man serve best? The answer must be had as many times as there are sound men of military age, as the man power of the nation is mustered for total war. The armed forces have the edge on several counts as essential industry competes for the men it must have to carry on its part of the fight. And in this competition, the oil industry is particularly vulnerable. There can be no organized front to compete for priorities of men as there has been with material. It is patent that men are as needed as is material, and there is a limit to how much the industry can economize in man power and do its required part of the war effort.

Management is confronted with the problem, and the duty, of fighting for personnel, and the right personnel. Obviously, no one man is indispensable either to the industry or to the service, which means that claims for military exemption must be based on logic. Both the Army and the men must be sold on the better men being needed in industry, for as the war effort progresses the urge among the kind of men most needed on the job, is to get in uniform. As the industry must operate on fewer men, the few must include some of the best. To hold them, management must sell them the idea that service in the oil field can be just as important as on the battle field; and that to seek deferment from military duty is not being a slacker when the service at home is essential to the war effort.

Many field engineers are out of military schools, and needed now for the Army duties for which they were trained. Labor in this industry develops brawn and spirit of good fighting men, men who are inclined to go, and such men as patriotic management hesitates to hold back. But the industry must keep some of them. Individual cases are individual problems. A big part of management now is holding the men necessary to get out the oil, and that calls for sound judgment, sane diplomacy, and tact.

• • • *OPC estimates that the 1943 production of the four critical petroleum war products, i.e., aviation gasoline, aviation lubricants, toluene and butadiene, will require a daily production of crude oil of 3,600,000 barrels or 88 percent of current volume. This quantity will be required irrespective of the demand for ordinary products such as motor fuel and fuel oil which would in effect be produced as by-products of the four critical military products. This reveals the startling fact to many that any curtailment on civilian consumption will have relatively little effect upon crude requirements.*

Depletion Deductions Fight to Continue

THE Treasury's attitude toward the depletion deduction may be made known by Secretary Henry Morgenthau March 3 when he appears before the House Ways and Means Committee at the opening of hearings on the 1942 revenue bill.

In interested circles it is believed the Secretary will reiterate sentiments he has frequently expressed in the past—that the depletion deduction permits an avoidance of taxes which costs the government large sums annually and should be repealed.

However, there is a definite opposition in Congress to any tinkering with the depletion provisions of the law, and delegations from the producing states have promised that if any effort is made to eliminate the allowance they will fight it vigorously.

Leaders in the industry also have promised to contest any changes in the present allowance, particularly in view of the Administration's refusal to permit increases in the price of crude, and it is probable that oil men will testify before the House committee regarding the necessity of safeguarding these provisions.

During his appearance before the committee, Morgenthau is expected to lay down the Treasury's recommendations for raising the seven billion dollars in new taxes asked in January by President Roosevelt. Until then, however, the department's program will be held confidential, to prevent the development of mass opposition to any phases before they can be thoroughly explained to the committee.

Shortages in East Will Hit Defense Workers

COMPLETE conversion of all automobile manufacturers to war production, stringent tire sale restrictions and indicated gasoline shortages in heavily industrial East Coast regions, if continued unchanged for long will create a distinct danger which might set back the country's whole war effort.

A great many of the war production plants, especially the newly constructed ones, are so located that in getting to and from work workers must rely principally upon private automobiles. Either sufficient private cars must be maintained, or some other transportation facility provided. By staggering working hours and school hours, the nation's 80,000 school and sightseeing buses could be utilized, but even this would be insufficient and some construction of new mass transportation facilities must be planned enough in advance so war factory work will not be delayed.

• • • *The Chamber of Commerce of the United States in a recent bulletin offers this excellent suggestion: "It is, at least, reasonably certain that no program of war production can be carried to a successful conclusion as long as one of its most important components, labor policy, remains an unknown quantity. It is futile to draft a 'blue print for victory' with a part of the foundation left out. The labor question is one which Congress might do well to consider again."*

EDITORIAL COMMENT

Allocations Based on Needs

By RAY L. DUDLEY, Publisher

FOR months THE OIL WEEKLY has been contending that no intelligent allocation of drilling and production materials could be made to the oil industry until the industry had a definite idea as to the amount of crude oil required and the possible production of present producing wells over a given period of time.

Elsewhere in this issue will be found the report of the Office of Petroleum Coordinator to the War Production Board in which a request for specific allocation of various products is based upon a study of actual needs.

We have studied the figures on wells and production and believe that they represent a fair compilation of the data available.

In the past when OPC has been asked as to how many wells should be drilled, officials have not been in any position to make definite recommendations because such recommendations had to be based upon the two factors mentioned in the first paragraph of this comment.

Thus, if someone, ill-informed on the oil industry, expressed the belief that sufficient oil could be produced without the drilling of new wells for two years, OPC has only been able in the past to offer its opinion against the opinions of those not acquainted with the operation of the industry.

Now we have something definite. Now we are told how much crude oil must be produced to develop certain petroleum products necessary to the war. The report does not deal with civilian consumption of motor gasoline for two reasons:

(1) If it is necessary to pro-rate the civilian user on gasoline this will be done.

(2) Motor gasoline will become a by-product in the manufacture of various fuel oils, lubricating oils and aviation gasoline—a by-product of such large proportions as to make disposal of the by-product a very important matter.

We are not prepared to say at this time, that a stepped-up program in search of new reserves is the wisest one, but the suggestions of OPC for 4000 wildcat wells, instead of the 3000 drilled in 1941 doesn't require a great deal of material. We have become convinced by the figures presented by OPC that a wildcat drilling program of at least last year's proportions is essential.

Whether or not WPB meets the request of the Office of Petroleum Coordinator with the allocations asked for is something else, but if such allocations are not forthcoming and there is a failure on the part of the oil industry to provide the necessary petroleum products for the winning of the war, WPB will be taking its action in the full face of all the information it requires and if the industry fails to provide the necessary oil it will be because WPB says openly that there are more important considerations than oil. Of course, we have no way of knowing what the attitude of WPB will be except that we do know that the WPB is composed, in the main, of competent men, patriotic men, and sensible men. These men are faced with a most difficult task and we must be assured that if the allocation as requested is not made it will be because they feel that less chance will be taken if we cut down our oil production than will be taken if we cut down other war materials.

In the minds of many there has recently been growing the thought that maybe our war production effort, geared up as it is to an almost unbelievable figure of production, may not be geared up with shipping capacity. In other words, it may be that there will not be enough ships to move the materials we are in the process of making—this despite a shipbuilding program of gigantic proportions.

It would, of course, be a sad mistake to limit the production of as essential a material as oil in favor of the production of equally essential materials built of steel when we can not move the output of these steel products to the field of battle. We hope that WPB will take this into consideration as well.

In the past several weeks we have talked to manufacturers of oil equipment who are just as harrassed as are oil men charged with the operations of substantial companies. The drilling contractor, the independent operator, the major oil company operators need not feel that they are alone in a solitude of harrassment. Their suppliers are equally disturbed. They have been saying that if the government would only give them an idea as to how many wells are going to be drilled, they can fit their capacities to war needs more intelligently and far more efficiently than they have been fitting them.

They have realized that oil is a highly essential material of war. They have known that if it were not for the general misconception that a sufficient quantity of oil to meet all needs can be produced indefinitely merely by turning the valves, the government and the people of the United States would be tearing their hair to get more oil. They have suspected what many oil people have suspected—the demand for oil, originating in turn a demand for drilling and production equipment, could be determined and they have been awaiting the day when such determination was made by proper government officials.

They have those figures now. The oil industry has those figures. The people and the government have them. Let us hope that they will be weighed carefully in the decision WPB must make.

★ ★ ★ ★ ★ WASHINGTON ROUNDUP ★ ★ ★ ★ ★

EXTENSION of Preference Rating Order P-98, which was to expire February 28; issuance of a Justice Department approved recommendation on consolidation of small tracts, and approval of the California plan for production quotas for fields, pools and wells featured a week which was marked also by a full and frank discussion of the oil situation by OPC officials before the Cole subcommittee.

Other developments of the week were the initiation of studies by OPA on price ceilings for oil-field equipment, and announcement by the House Ways and Means Committee that it would open hearings on the tax bill March 3 with Secretary Morgenthau as the first witness, at which time the Treasury head will disclose whether he intends to fight for elimination or reduction of the depletion allowance.

P-98 Extended

A scant 30 hours before preference Order P-98 was scheduled to expire, OPC sent to the War Production Board its recommendations for extension of its application until April 30, together with suggestions as to needed revisions.

Completing the order late on February 27, it was shot over immediately to Donald M. Nelson, with the expectation that it would be approved and published before the deadline on February 28.

Almost immediately, OPC experts will begin the work of drafting a more permanent order to come into operation on May 1, believing that sufficient experience has not beeen obtained to show the way to relieving the industry of the uncertainty attendant upon the short-term orders so far applied.

It was understood that no changes are made in the preference ratings, except that natural gas and natural gasoline plants are given the same ratings as refinery operations, but that the set-up has been changed from the division by functions (production, refining, etc.) to a grouping by ratings, with all operations eligible for A-1 ratings listed under that head.

By B. F. LINZ
Washington Correspondent

Preference Rating Order P-98 Extended Month

Consolidation of Properties Given Approval

Davies Before Cole Committee

★ ★ ★ ★ ★

Among the important changes which OPC advocated was one in the provision covering maintenance, repair and operating supplies, in which it is set forth explicitly that the ratings applicable to such supplies may be applied to replacement of parts of an item carried as a fixed asset, as well as the whole item, provided that the cost is charged to operating expense and not to capital account.

Officials explained that if an operator, for instance, needs to replace a joint in a pipe line, or a tubing or casing, and the operation is properly chargeable to operating cost and not capital account, he can apply the preference rating which is assigned to maintenance, operating and repair supplies.

Another change sponsored by the OPC provides for a new inventory basis, defining the minimum practicable inventory as on not exceeding 90 days' supply of materials, which will permit operators to obtain materials without having to go to the OPC.

Similarly, operations were somewhat eased by a provision covering materials costing more than $500 which permits that, if all the desired items are for a single project, they may grouped in one order and require only one counter signature. The orginal P-98 required the countersigning of each item.

A new provision, providing an A-10 rating to office supplies such as paper, etc., is to be incorporated in the order.

The coordinator's office proposed that all industrial functions be redefined along the following lines:

"Production" to include the discovery, development and depletion of petroleum pools; operation of any stationary gathering systems or surface connections for the conveyance of petroleum (other than natural gas) to the first valve on the discharge side of the field shipping-tank battery at which oil is gauged; operation of any facility for the processing of natural gas including natural gasoline extraction plants, field pressure-maintenance plants, repressuring plants, cycling plants, dehydration plants and desulphurization plants; operation of any natural gas connecting lines from a wellhead connection or from a main gas trunk line to or from such plants; and operation of any stationary gathering systems or surface connections for the conveyance of natural gas to the point of connection with a main gas trunk line.

"Refining" to include operation of plants, other than those coming under production, for the production of finished blend neutral, bright-stocks and long residuum to finished SAE grades.

"Transportation" to include, except in the case of natural gas, operation of all oil terminals and terminal storage facilities; operation of all pipe lines for transportation of oil from the first valves on the discharge side of the field shipping tank battery where petroleum is first gauged to any refining facility, terminal or terminal storage facility, and from any refining facility to any terminal, terminal storage or marketing facility.

"Marketing" to include operation of all facilities other than petroleum terminal or terminal storage facilities, or marine, rail or truck

facilities used to transport petroleum, for distributing or dispensing petroleum (not including natural gas), including operation of service stations, substations, bulk plants, warehouses, wholesale depots or facilities operated by consumer accounts.

"Main gas trunk line" to be defined as any pipe line and appurtenant structures carried as "trunk line" on the books of an operator in accordance with the regulations of any duly constituted public regulatory body or, where there is no such body regulating the accounting procedures for federal income tax purposes.

It was explained that this final definition was added because equipment classified under production will cover natural gas pipe lines from the wellhead up to their actual junction with the main trunk pipe line, while formerly equipment came under production up to the initial input meter only. However, it was pointed out, natural gas pipe lines are not covered by the order but, as heretofore, come under order P-46.

Consolidations

Consolidations of property interests to make up the 40-acre tracts necessary under the well-spacing pattern requirements of Conservation Order M-68 is provided for in OPC Recommendation No. 32, issued this week with the approval of Assistant Attorney General Thurman Arnold.

The recommendation was addressed to the state regulatory bodies, the several production committees and to producers. Its provisions, primarily intended to cover the situation of oil operators, apply as well to natural gas and condensate pools.

In the order, OPC explained that in order to avoid the creation of tracts whose owners do not have the opportunity to participate in the production of a field, it is necessary that they be consolidated with adjoining tracts or drilling units within which they would most logically fall, "irrespective of whether such consolidations occur prior or subsequent to the formation of such adjoining tracts into drilling units upon which wells are or are to be located.

"If a portion of the owners in a field fail or refuse to afford the remainder of such orders a reasonable opportunity to participate in the development thereof or the production derived therefrom, those who have been so deprived may apply for exceptions to those orders which prohibit the use of material to drill wells except in specified instances, by reason of their own willingness to enter into reasonable consolidation agreements and the failure or refusal of the adjoining owners to undertake such consolidations," it was held.

Text of the recommendation on page 46.

Revisions

Extension of OPC Recommendation 33, dealing with the pooling of facilities, to the greater part of Districts 2 and 3, and a revision of conservation order M-68-C, dealing with marketing, were "in the mill" over the weekend.

The extension of the OPC recommendation was discussed at meetings February 26 and 27 in New York, attended by representatives of the committees from the three districts, as a means of securing additional deliveries of oil products along the Atlantic coast.

On Friday, Deputy Coordinator Davies telegraphed the heads of 15 Eastern companies, requesting them immediately to transfer to the domestic heating oil service all suitable tank ships now engaged in hauling gasoline from the Gulf coast, and increase tank car movements of such oils "to the maximum."

OPA Studying Equipment Price Situation

Representatives of the Office of Price Administration and of oil-field-equipment manufacturers met in St. Louis February 20 for a further dicussion of the price situation on which a conference had been held earlier in the month in Dallas, and OPA officials in Washington this week were studying information on which it was expected price ceilings for such equipment will be set in the near future.

It was said, however, that no decisions were reached at the St. Louis conference which, in fact, was not so constituted as to permit it to take any official action, but it was indicated that some sort of an agreement had been reached regarding the basis on which price ceilings for oil-field equipment should be calculated.

Many of the group who attended the Dallas conference were at the St. Louis meeting, at which information found desirable at the earlier session was submitted for discussion. No further conferences are planned, and the future work on the proposed price ceilings will be carried on in Washington.

OPA experts said that some time probably would elapse before the price ceiling order was definitely framed for issuance.

• CONGRESS •

Davies Tells Committee Sustained Drilling Program Required

The urgent need for quick adjustment of price ceilings as a means of encouraging badly needed exploration as well as to compensate the East Coast companies for heavy losses incurred in the use of tank cars; the desirability of maintaining the depletion allowance of the revenue code unchanged, and the development of an oil-and-rubber-industry program which will give the country a synthetic rubber production of more than 500,000 tons annually by the end of 1943 were emphasized February 25 at hearings before the Cole subcommittee.

As before, the hearing was presided over by Representative Clarence Lea of California, chairman of the full House Interestate and Foreign Commerce Committee, in the absence of subcommittee chairman Cole.

Chief witnesses were Deputy Coordinator Ralph K. Davies and Federal Loan Administrator Jesse H. Jones who, between them, cleared up many of the questions in which the subcommittee had expressed an interest during the testimony of Coordinator Ickes February 17.

Frankly admitting that the material situation will make necessary a reduction of at least 40 percent in the 1942 drilling program, Deputy Coordinator Davies told the subcommittee also that, insofar as

[Continued on page 44]

OPC Says 19,300 Wells Will Meet '42 Requirements

Survey of Industry's position and equipment needs prepared for WPB and presented to the Cole Committee in Washington last week, emphasizes necessity for continued development in production branch to insure adequate supply of petroleum products for the War Program

THE growing shortages of critical materials resulting from the urgent requirements of the war program make it necessary for the War Production Board to review carefully the needs of all industries, with a view to limiting expenditures to the minimum consistent with essential operations. With respect to the petroleum industry, the question has been raised concerning the necessity of expending materials in the production branch for the drilling of wells, referring particularly to development drilling as opposed to exploratory drilling. This report presents an analysis of the situation which shows that it is essential to make available certain quantities of materials for development as well as exploratory drilling in order to provide an adequate sustained supply of petroleum for the war program.

Essential Character of Petroleum

The importance of petroleum to the war program and supporting essential industrial and civilian activity is quite widely and fully recognized. Petroleum has often been appropriately termed the "life blood" of our nation, and it truly is an absolute necessity to the war program and to our modern industrial operations. Without the products of petroleum, our air arm could not rise from the ground to engage in combat; modern armies could not be placed and maintained in the field; our naval units would be reduced to hulks of scrap metal; transportation facilities would be largely stalled for want of fuel, proper lubricants, or other products; our entire industrial system would likewise be practically paralyzed; and the whole range of human activity would automatically be drastically curtailed. It therefore follows that it is imperative, as a part of the war program, to insure an adequate and sustained supply of petroleum products to meet fully all likely or possible military and essential industrial and civilian requirements for such commodities.

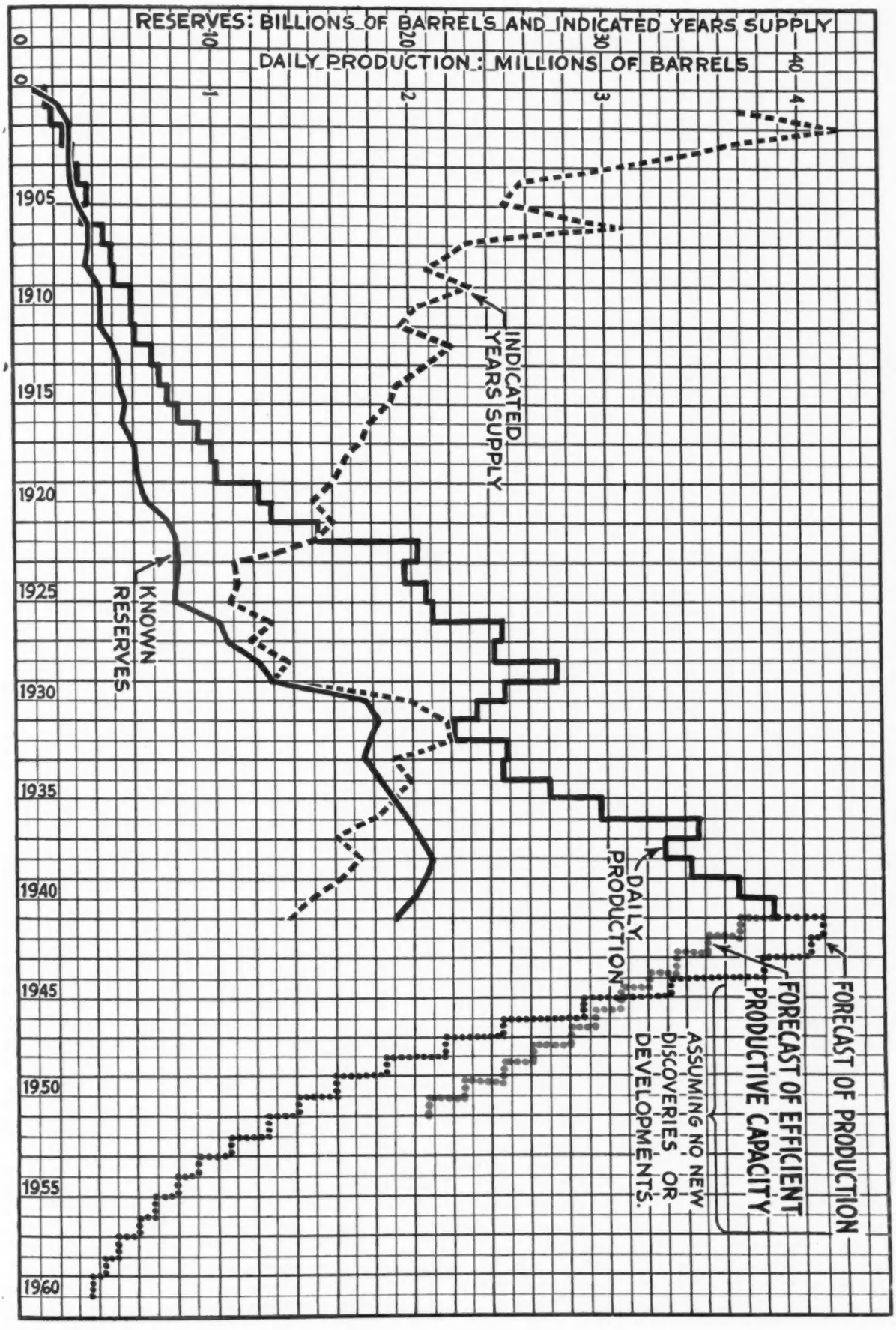
Necessity for Maintaining Petroleum Reserves

The first and principal requirement to insure an adequate and sustained supply of petroleum products for the war program and other essential needs is to develop and continuously maintain sufficient *known* and developed underground reserves of crude oil and natural gas to provide the productive capacity to meet all necessary demands for these raw materials. The other requirements of course involve providing adequate transportation, refining, and distribution facilities in order to gather the raw materials, manufacture the desired products, and deliver them to the points of need. However, the maintenance of adequate *known* developed reserves is the basic requirement, for crude oil and gas reserves constitute the foundation of the entire petroleum industry. Without a supply of the raw materials out of which petroleum products are made, the refining and other facilities comprising the industry would serve no useful purpose.

Productive Capacity and Required Reserves

The maintenance of adequate petroleum productive capacity is dependent upon active exploratory operations to locate new fields and upon proper development of the new reserves as discovered. Such operations must proceed concurrently with production operations, for new fields cannot be discovered and developed overnight or at will. The process is at best complicated and time consuming.

The discovery and development program should be designed to locate and make available for production new reserves at a rate consistent with the total known developed reserve on hand at any time and with the rate of production and consumption of the known reserves at the same time. Such a program is necessary for two principal reasons. Firstly, the fluid and fugacious nature of oil and gas is such that they ordinarily are readily handled, refined, and transported rapidly and in large volumes; but these same properties make them relatively difficult and expensive to store aboveground in large quantities in relation to demand. Thus, oil and gas are produced for use on substantially a day-to-day basis, particularly so in the case of gas, and the aboveground stocks or inventories of oil are relatively small in terms of consumption or days' supply. Secondly, developed petroleum reserves and productive capacity are actually a "wasting asset," and each barrel of oil produced from a given developed reserve diminishes the size and the productive capacity of that particular reserve. Hence, in order to maintain productive capacity at the required level, the production or depletion of known developed reserves must be offset by new dis-



Reserves and Production of Crude Oil in the United States

coveries and development; and a backlog of known and developed underground reserves must be maintained at all times in an amount consistent with the current and likely future requirements for petroleum.

The history and experience of the industry indicates that the amount of known developed underground reserves on hand at all times should be maintained at the equivalent, in terms of the likely consumption, of an *indicated* supply for at least 15 years, and preferably 20 years, in order reasonably to insure an adequate sustained supply and to provide reasonably efficient operation and oil recovery. To one who is not fully informed of the physical conditions surrounding the production of petroleum, an "indicated years' supply" of 15 to 20 years may seem quite abundant, and it might be concluded that a moratorium on well drilling and petroleum operations could be declared for an indefinite period without serious consequences under such circumstances. Thus, for example, it might be thought that a known developed underground reserve of 15 billion barrels of oil would sustain a production rate of one billion barrels annually for 15 years without further discovery and development of new reserves during the period. That such reasoning is completely erroneous is commonly recognized throughout the industry and is revealed fully by the actual production histories of literally hundreds of oil fields. As indicated previously, the productive capacity of any specific reserve diminishes continuously as production and consequent depletion of the reserve proceeds. Experience shows that the natural physical limitations on the rate at which oil can be produced are such that most oil fields must be operated for a period of at least 25 years and usually longer in order to obtain all of the oil that is practicably recoverable.

Status of U. S. Oil Reserves

The question has been raised concerning the adequacy of the *present* known petroleum reserves of the United States to supply for an indefinite period the requirements of the war program and essential supporting activity. As a move to conserve critical materials, it has been suggested that well drilling, particularly that concerned with the development of fields, might be eliminated or drastically curtailed for a period of time. The consequences of such action may be quite definitely determined through an analysis of the present petroleum reserve situation. Resort to theory, trial, or speculation is unnecessary, as reasonably accurate deductions concerning the results of following such a course may be made simply on the basis of operating experience.

The nation and the petroleum industry are fortunate in that the industry has, over past years, been able to supply all requirements for petroleum and at the same time to build up a substantial backlog of known underground reserves of crude oil. As of the first of the year 1942 there existed a known underground oil reserve of approximately 19 billion barrels which is the result of continued discovery and development operations extending over past years as far back as the year 1900 and before.

Referring to the attached chart, it is seen that the known underground reserves of crude oil in the United States have increased greatly over past years, despite a more than 20-fold increase in rate of production since the year 1900. Reserves have been increased from a level of between 2 to 4 billion barrels in the decade 1900-1910 to about 19 billion as of the first of the year 1942, while daily production has risen from just under 180,000 barrels per day in 1900 to 3,845,000 barrels per day for the year 1941. Production continues to mount rapidly as a result of the war program, and it is now just under 4,100,000 barrels daily which is equivalent to an annual production of close to 1½ billion barrels.

Under the current demand for petroleum the current known underground reserve is equivalent to an "indicated years' supply" of about 13 years. While there exists sufficient productive capacity to satisfy the immediate demands likely to be made upon the industry without material effect upon producing efficiency, yet the current reserve in terms of current oil requirements is less than the minimum value of the proper level of reserves. Actually it would be desirable to have available a known developed underground reserve of around 25 billion barrels under the current rate of production as compared with the present actual 19 billion barrels.

The thought is prevalent among those who are not informed on the subject that the United States is possessed of a great abundance of petroleum and that, without qualification, the industry is prepared to meet indefinitely all requirements. It is unfortunate that the industry itself is partly responsible for this erroneous and harmful public impression.

The performance of the industry in the past indicates that it will likely be able to fill the demand for petroleum unless a too drastic limitation of operations, because of restrictions on materials, is imposed. However, it will be shown that unless materials required for necessary drilling operations are made available, the reserve position would soon become critical and the productive capacity would diminish rapidly far below anticipated essential requirements.

The attached chart demonstrates the fact rather strikingly that contrary to popular belief, an overabundant known underground crude oil reserve does not exist in the United States at this time. It shows clearly that the petroleum industry must be in a position to carry on exploration and discovery activities with even greater intensity than in the past and that reasonable development operations must also be conducted.

Plotted on the chart are: (a) the known underground reserves of crude oil as of the first of each year since 1900, (b) the average daily production by years since 1900, (c) the "indicated years' supply" of crude oil represented by the known underground reserves, which is obtained by dividing the known[1] underground reserves shown for the first of each year by the annual production of the preceding year, and (d) forecasts of production and efficient productive capacity assuming that new discovery and drilling operations were stopped as of January 1, 1942.

Forecast of Productive Capacity With No New Development

The most significant features of the chart are the forecasts of the rapid reductions in productive capacity of presently known reserves which would occur under the assumption that new discovery and development operations were terminated as of January 1, 1942. These are indicated by the light dotted black and red lines on the chart projected from the beginning

of the year 1942. As previously stated these forecasts are based simply upon actual operating history and experience.

The light dotted black line was forecast on the premise that drilling would cease entirely on January 1, 1942, and that production would be continued for as long a time as possible at the present national total production rate of about 4,100,000 barrels per day. It is seen that the current production rate could be maintained under such circumstances only through the present year and that the year 1943 would witness the beginning of a natural decline in production. By 1944 productive capacity would drop to 3,800,000 barrels per day, and it would fall very rapidly thereafter as shown.

The light dotted red line was forecast on the premise that production would be limited at all times to the estimated efficient production rate for each field and that all exploratory operations would cease but that drilling would proceed until all presently known reserves were fully developed. It is estimated that this would require approximately 11,400 wells. Under such conditions, production would have to be reduced to 3,700,000 barrels per day for 1942, and it would thereafter diminish at the rate of about 150,000 barrels per day annually. The two dotted curves bound the range of varied conditions within which it might be expected that the rate of crude oil production might logically be expected to fall. It is significant that even though production of crude should be artifically limited in the future to say 3,500,000 barrels per day, by restriction of the consumption of petroleum products for reasons of rubber or automobile shortages, transportation difficulties, or other causes, such a production rate could not be maintained without continued drilling to discover and develop new supplies of oil for maintaining a proper backlog of developed reserves.

Another factor of considerable importance, bearing upon the question of maintaining oil production during the year 1942 under the assumption of cessation of drilling, is that some 43,000 wells now flowing naturally would soon necessarily have to produce at capacity in order to offset the decline in production of older wells. The result would be that such wells would soon cease natural flow and would then require installation of pumping or other artificial lifting equipment. This equipment involves the use of the highest quality steels as well as gears and engines, all of which are critical. With continued development and the maintenance of reserves at a proper level, the majority of the wells in question would continue to flow naturally indefinitely.

Diminishing Trend of "Indicated Years' Supply"

Referring to the historical features of the chart, it is to be noted that while the known underground reserves of crude oil have been greatly increased over past years, yet the increase in reserves has not kept pace with the phenomenal record of the rise in production. In other words, the expression of known reserves in terms of future supply has diminished substantially over the long term as a result of the tremendous increase in the demand for crude oil. This fact is revealed by the heavy black dashed line plotted on the chart and labelled "Indicated Years' Supply" which as indicated before, was obtained by dividing the known underground reserves on hand as of the first of each successive year by the annual production during the preceding year. It is seen that although only relatively small reserves of crude oil were known at the beginning of the century, yet they were large in terms of the annual production at that time and constituted an indicated supply for the demand at that time of from 30 to 40 years. As the demand for oil rapidly increased, the indicated years' supply trended downward sharply until the latter part of the decade 1920-1930, even though discoveries of new reserves exceeded production and substantial additions to known reserves were made.

With the widespread application of approved scientific exploration technique and as the result of the discovery of several exceptionally large fields, known reserves gained rapidly following the year 1925 and out-stripped the rising demand for oil, so that the indicated years' supply increased from a low of 11 years, as of the first of 1926, to 22 years for 1933. At that time, however, the trend reversed, and it has since been sharply downward, having reached a value of just under 14 years as of the first of 1942.

Necessity for Continued Discovery and Development

The decidedly downward trend in the indicated years' supply of known underground crude oil reserves presents a rather unfavorable outlook when one reflects upon the necessity of insuring an adequate sustained supply of petroleum for the war program and supporting essential activities. The picture becomes more disturbing when the fact is realized that new discoveries of petroleum have failed to balance production during the past three years by a total of about two billion barrels, as may be seen by reference to the chart. Furthermore, the known reserves of natural gas have been seriously depleted in important sections of the country because of the lack of further discoveries. Demand for gas by strategic and essential businesses in highly industrialized areas is now seriously pressing the available supply.

The cause of this situation may be traced entirely to the simple cold fact that the discovery of prolific new fields, particularly in the case of oil, is becoming increasingly difficult, despite continuous improvement of prospecting technique, as drilling proceeds at greater depth and as the more favorable possible oil productive areas become more thoroughly combed and tested. This does not imply that there do not remain important unknown fields yet to be found. It is a fact, however, that oil is becoming harder to locate, as each new discovery made simply means one less for the future.

The increasing difficulty of discovering new petroleum reserves is attested by the fact that despite exploratory activity, less new reserves have been discovered. This is shown by the table below which presents the history of exploratory operations over the past several years.

It is to be noted that exploratory drilling has increased considerably in recent years. Although this greater activity resulted in the discovery of a larger number of new fields, yet the quantity of new reserves discovered has diminished because of the progressively poorer quality of the new fields found.

The position of known reserves in terms of the likely future re-

[1] It should be understood that the known underground reserves shown for any particular time represent the estimated recoverable oil then remaining in all of the oil fields discovered up to that time. Thus the reserve indicated for a specific date does not include the reserves of those fields subsequently discovered.

History of Exploratory Operations—1934-1941

YEAR	Total Wildcat Wells Drilled	Successful Wildcats	Number New Pools Discovered	Total New Reserves Discovered: Barrels	New Reserves Discovered Per Pool: Million Barrels
1934	....	....	86	1,668,000,000	19.4
1935	....	....	104	1,901,000,000	18.3
1936	....	....	104	1,737,000,000	16.9
1937	2,224	222	148	1,898,000,000	12.8
1938	2,638	294	166	1,816,000,000	11.0
1939	2,589	224	170	766,000,000	4.5
1940	3,038	302	217	674,000,000	3.1
1941	3,113	486	340	400,000,000	1.2

quirements for petroleum should be improved. In the light of the earlier discussion concerning the dependence of productive capacity upon the maintenance of an adequate backlog of known developed underground reserves, it is obvious that the downward trend cannot long be permitted to persist if an adequate domestic supply is to be continued. Even at this time some of the important oil-producing areas are pressed to the limit of capacity to supply the local demand for oil. Many fields are being operated at excessive rates of production which lessens oil recovery and further diminishes the known recoverable reserve and accelerates the decline in productive capacity. This condition, coupled with the inability to predict the duration of the present conflict, clearly indicates the necessity for intensified exploratory work. Although it may not be possible to provide sufficient materials to strengthen the known petroleum reserve position at this time, sufficient drilling must be done to discover and properly develop *new* reserves of oil and gas at a rate at least equal to that at which known or previously discovered reserves are produced and consumed.

In discussing the problem of maintaining adequate domestic reserves of petroleum, it has been suggested that future drilling programs should be directed or confined to discovering and developing the most prolific and strategic fields and the most desirable crudes, such as, for example, aviation-gasoline-yielding crudes and other desirable types depending upon requirements. While a limited degree of choice might possibly be exercised to advantage, it should be kept in mind that it has not been possible to discover sufficient new reserves to balance required withdrawals during recent years regardless of any consideration of the quality of the field or the type of crude. The fact of the matter is that all additions to all types of reserves would be welcome and desirable. Proper cognizance of variations in the quality of fields and crudes can be taken, with reference to the expenditure of scarce materials, by making suitable adjustments in the development programs.

The thought has also been expressed that greater reliance should be placed upon the petroleum reserves of other countries in the Western Hemisphere to supply the requirements of the United States. In considering this point it should be recognized that other petroleum-producing countries of this hemisphere do not possess any surplus of known developed reserves and that, from the standpoint of the expenditure of critical materials, it would require materials to discover and develop added reserves in South America just as it will in this country. Without considering the merit of other phases of this question, it will suffice to say that the United States should strive always to remain self-sufficient as far as petroleum reserves and available petroleum supply are concerned. Although under normal circumstances it might be wise to consider drawing more extensively on foreign reserves, a domestic supply fully adequate to meet all likely requirements must be maintained in this emergency. It would be folly to depend to any substantial extent upon importations of foreign crude because of the serious limitations of transportation facilities arising from the challenge to our sea lanes.

Future Crude Requirements

The current demand for domestic crude-oil production is close to 4,100,000 barrels per day which amounts to nearly 1½ billion barrels per year. Because a large portion of the products from this volume of crude finds its way into civilian uses not directly related to the war program, it is not widely understood that much of the production is necessary to supply the constituents of the four petroleum products considered to be of greatest direct importance to the war program; namely, (a) aviation gasoline, (b) aviation lubricants, (c) toluene, and (d) synthetic rubber.

It has been estimated that nearly 2,600,000 barrels per day of crude will be needed to produce the requirements of these essential products for this year. With the completion of additional units in 1943 for the manufacture of the four critical petroleum products, the crude requirements will mount to almost 3,600,000 barrels per day, or over 1.3 billion barrels per year, which is equal to 88 percent of the current volume of production. This quantity of crude will be required irrespective of the demand for ordinary petroleum products such as motor gasoline and fuel oil, which would in effect be produced as by-products of the four critical military products. It therefore becomes apparent that any possible curtailment of civilian consumption of gasoline or fuel oil would have a relatively small effect upon crude-oil requirements.

There has been much loose talk of the possibilities of reducing crude-oil requirements by restricting so-called non-essential civilian consumption of motor fuel. While admitting that some non-essential uses of gasoline could be eliminated without serious consequences, yet there exists considerable doubt as to the extent to which civilian consumption of motor fuel could be limited without jeopardizing essential industrial activity. It is believed that essential needs for petroleum will actually increase beyond the current level of production. The controlling factor in the matter will be fuel oil, and, irrespective of the effects of the rubber or automobile shortages or of possible artificial curtailment on motor fuel consumption, the essential needs for fuel oil will likely require the maintenance of crude-oil production at or above the current level. The crux of the matter is simply that limitation of crude-oil production through restriction of gasoline consumption would seriously affect the supply of fuel oil, for, with the essential requirements of other products, fuel oil yields can be shifted only moderately, probably a maximum of 5 percent on the total volume. The supply of fuel oil is "tight" at this time, and any sub-

stantial restriction in use would soon raise other important problems concerning critical materials and would also seriously affect essential industrial operations.

Drilling and Material Requirements for 1942

Over the past six years exploratory and development drilling for oil and gas has totaled in excess of 25,000 to a high of approximately 32,000 wells annually. As pointed out before, discoveries of new reserves of oil in the past three years have not kept pace with production, and the reserve position in terms of the growing demand for petroleum has become progressively less secure over the past decade in spite of the large amount of drilling done.

With the urgent requirements of critical materials for direct military purposes and the consequent steadily growing shortages, it is fully recognized that the production branch of the petroleum industry must conduct its operations with greatly reduced expenditures of materials. This simply means that the industry is faced with the formidable task of discovering, developing, and producing more and more petroleum with less and less material. Because of the none too satisfactory level of known underground reserves, exploratory activity, particularly, must be pressed with increasing intensity.

Prior to the outbreak of war it had been hoped, because of the urgency of continuing the discovery and development of new petroleum reserves, that the production branch of the industry would be able to continue without serious reduction in the scale of drilling operations, despite the fact that general shortages of materials had already developed. Shortly before hostilities began, however, it became fully apparent that the industry could not hope to receive other than the bare minimum amount of materials required to permit a reasonable continuation of necessary operations. Accordingly, thought was given to the methods whereby the limited quantities of materials available could be placed to the most advantageous use. This culminated in the promulgation of Conservation Order M-68. The effect of this order is to make available a greater quantity of oil per pound of steel expended by broadening the spacing of wells and by eliminating over-development or unnecessary drilling in any particular field. Thus a greater quantity of underground reserves of petroleum can be made available for production with a minimum practicable use of materials.

While considerable savings of materials can and will be made in petroleum-production operations, it is essential to realize that materials necessary for the continued proper functioning of the production branch of the industry must be made available if an adequate sustained supply of petroleum is to be provided. Under the operation of Conservation Order M-68, it is estimated that the drilling of about 19,300 wells in the United States during the year 1942, properly divided between exploratory and development operations, should be sufficient to maintain fairly satisfactorily the required domestic productive capacity to enable the production of at least 1¼ billion barrels of oil during the year. The estimate of 19,300 wells for 1942 is 39 percent below the 31,733 wells drilled in 1941. The detail of the estimate of domestic drilling required in 1942 is as follows:

	Oil	Gas	Dry	Total
Exploratory Wells	624	116	3,260	4,000
Development Wells	11,164	1,829	2,294	15,287
Total	11,788	1,945	5,554	19,287

It is noted that the estimate of required drilling in the United States in 1942 is divided 4000 wells to exploratory work and the remainder to development. The 4000 wells set aside for exploratory operations is nearly 29 percent greater than the total of 3113 wildcat wells drilled in 1941, which was an all-time high. Because of its obvious importance, the Office of Petroleum Coordinator has emphasized and will continue to urge intensified exploratory activity. If the estimated total required number of wells are drilled, it may be expected that around 5500 to 5600 will be dry, something less than 2000 will be gas wells, and the rest oil wells. The dry holes will require only a minor amount of material as compared with the estimated 13,733 successful oil and gas well completions. The reason for this is that little or no casing or other tubular goods are left in unsuccessful wells. The estimate of 13,733 oil and gas well completions for the year 1942 compares with 23,100 in 1942 and represents a 40 percent reduction. This means that the expenditure of materials in the production branch in 1942 will be at least 40 percent less than the quantity used in 1941. It can be stated with assurance that a minimum reduction of 40 percent will be automatically accomplished under the application of Conservation Order M-68.

An estimate of the various classes of material requirements for the production branch of the industry for the year 1942 has been made. The requirements are based upon the proposed drilling program and necessary auxiliary operations as discussed above. The detail of the estimate is as follows:

Ferrous Materials	Tons
1. Cutting tools	985
2. Nickel bearing steel	36,800
3. Other alloy steels	59,900
4. Carbon steel	262,000
5. Steel castings	22,300
6. Steel scrap	30,800
7. Steel bars and shapes	154,000
8. Wire rope, etc.	8,900
9. Steel plate	32,900
10. Steel sheet	61,100
11. Tubular goods	925,000
12. Drill pipe	33,400
13. Pig iron—iron castings	64,800
14. Iron scrap	58,900
15. Ferrous alloys	1,110
Total	1,752,895

Non-Ferrous Materials	Tons
16. Tungsten	179
17. Nickel	111
18. Copper	4,910
19. Zinc	5,840
20. Tin	780
21. Lead	780
22. Aluminum	1,150
23. Rubber	4,280
24. Synthetic rubber	1,275
25. Plastics	157
26 Chemicals	4,250
27. Cordage	1,810
Total	25,522

The foregoing estimate shows a required ferrous tonnage of approximately 1,750,000 and a nonferrous tonnage of 25,500. As indicated before, these quantities of materials are about 40 percent less than the expenditures of materials in the year 1941.

Recommendation

It is the belief of the Petroleum Coordinator's Office that the quantities of materials specified herein represent a reasonably accurate picture of the essential requirements of the production branch of the petroleum industry necessary to provide an adequate sustained supply of crude oil and natural gas to support the war program. Accordingly, the recommendation is hereby made that the War Production Board be urged to allocate to the production branch of the petroleum industry, for the year 1942, the specified amounts of materials, if at all possible and consistent with the urgency of the requirements for military and other war industry purposes.

Little Chance of Overcoming

Movement by Tank Car and Pipe Line Fails to Overcome Loss of Tankers Sunk or Diverted

ALTHOUGH shipment of petroleum into the East Coast area by tank car, barge and pipe line is expected to continue to rise, there is no indication that sufficient oil can be moved to completely offset the tanker situation. Consequently, stocks on the East Coast should continue to decrease, and curtailment of consumption apparently is almost unavoidable. The decision to regulate deliveries of fuel oils in the district strengthens this view.

Continuation of declines in stocks on the East Coast, further tightening of the tanker situation and indications that the volume moving by water to the area will decline as additional boats are sunk and diverted to the West Coast, has again focussed attention on use of tank car and pipe line as a means of offsetting the tanker shortage.

Greater Tank Car Use

The outlook for increased shipments of crude and refined products into District 1 by tank car is good. Such movements have been rising steadily to new peaks in recent weeks. In the week ended February 21, 10,162 tank cars moved into the area shipments averaging 326,636 barrels daily; whereas 7987 cars brought in 256,725 daily the week before, and 6935 cars brought 222,975 daily in the February 7 week. About 65 percent of the oil involved was crude.

Efficiency of tank-car handling, it has been pointed out by District 1 transportation officials, has been improved materially; loaded cars standing two days on sidings and in refineries are no longer the rule. It is declared that with further improvements and greater usage of tank cars, the volume of crude and products that can be brought into the district should reach 350,000 barrels daily if traffic congestion is avoided and sufficient locomotives are available. Ickes has stated it is possible railroads may operate under a cargo priority system to increase the use of tank cars.

With respect to pipe-line deliveries, authorities declare that as far as refined products are concerned the volume has been rather small but will soon expand with beginning of regular deliveries by the Plantation and Southeastern pipe line systems. A Plantation official declared two weeks ago that tank cars began taking 20,000 barrels of refined products daily from the end of the line at Greensboro, South Carolina, for trans-shipment to Eastern Seaboard points. When all pump stations are in operation, this line will have a capacity of 60,000 barrels per day, but much of this will be removed at points along the route. The capacity of Southeastern pipe line is 30,000 barrels per day. Both of these lines will release tank cars for moving petroleum into the Eastern area. It has been learned from transportation committee of District 1 that by the middle of March, about 64,000 barrels per day of refined products will be entering District 1 by pipe lines, and that pipe-line consignments of crude should be at least 65,000 barrels per day.

General Situation

However, there seems to be little prospect that a large proportion of East Coast oil requirements can be met by tank cars and pipe lines in the near future. Tank cars apparently will not bring in much over 350,000 barrels per day, crude shipments of pipe lines evidently will be about 70,000 barrels, and at best transportation of refined products by pipe lines will total around 90,000 barrels daily. Shipments by barge are under 100,000 barrels daily.

The sum of these totals is 600,000 barrels per day, or 36 percent of the 1,650,000 barrels per day needed to fill requirements. With a score of tankers already sunk and others to be attacked, plus the diversion of boats to the West Coast and others to be diverted, this sum is not sufficient to offset tanker losses. In addition, tanker movements are being delayed by the submarine attacks, and probably will have to depend upon slow convoy system before long.

Depletion of East Coast inventories when stocks already were abnormally low and disrupted shipments indicate the gravity of the situation.

The Office of Petroleum Coordinator has approved a plan for regulating deliveries of fuel oils. The plan limits fuel deliveries to resellers and consumers to prevent hoarding. OPC also is urging tankers to carry fuel oil, so there will be sufficient supply for industrial needs; which means civilian motorists will suffer.

Ickes called for a voluntary cut of 15 percent in civilian gasoline consumption. If the current appeal for voluntary action fails, rationing is considered unavoidable.

Eastern Needs Desperate

Seriousness of the shortage of petroleum products, particularly fuel oils, on the East Coast was emphasized during the past week by an SOS call from a major company for both light and heavy fuel oils from the Southwest and by moves made in the latter, supplying region for increasing overland movement of oils.

From New York, W. S. Farish, president of Standard Oil Company (New Jersey), telegraphed all refiners of fuel oil as far west as Nebraska, Kansas, and Texas, seeking supplies of kerosene, range oil, No. 2 heating oil, and Bunker C or No. 6 fuel oil, of which, he explained, "we are in desperate need." He added that refiners could quote prices on loaded tank cars for delivery in 30 or 60 days or offer oil for which his company would furnish the cars. The move was described as an effort to avoid rationing in the East in the early future.

Congestion in Southwest

While suppliers of the East Coast were gravely concerned over their ability to continue meeting demand

Oil Shortage On East Coast

OPC Committee in Southwest Undertakes Study of Situation and Possible Remedy

for petroleum products, producers and refiners of the Southwest became increasingly conscious of the tanker shortage through backing up of crude oil and finished materials on the Gulf Coast and through shrinkage of demand for crude in some of the inland producing areas that feed their output into the Gulf-Atlantic movement.

In consequence of the transportation shortage and resultant piling up of stocks on the Gulf Coast, Humble Oil & Refining Company, reduced purchases of West Texas and New Mexico crudes 40 percent and cut takings by 50 percent in Southwest Texas fields yielding high-gravity low-octane crude. Independent refiners of the Gulf Coast have been similarly affected. One refinery owner shut down his plant at Houston, because storage was filled, pending arrival of tankers to provide relief, and several other refiners said they would be forced to shut down shortly for lack of storage unless tankers arrived promptly to move products that had been sold but not lifted. Practically all of the independent refiners of the Gulf Coast expected to reduce their crude purchases in March because of refined products filling storage. The situation was recognized by OPC, Bureau of Mines, and Texas Railroad Commission, and was reflected in OPC's lowering of recommended production rates for March in Texas, Louisiana, and New Mexico, and in reductions of allowables by the state conservation authorities of Texas and New Mexico.

Committee Works on Problem

To work immediately on the increasingly serious problem of bolstering movement of oils from the Southwest to the East, five pipe line company executives were appointed as a special sub-committee of the Transportation Committee of District 3, Office of Petroleum Coordinator, the group having been designated by H. C. Wiess, of Houston, chairman of the transportation committee and president of Humble Oil & Refining Company, as a subcommittee on emergency supply. The subcommittee was asked to go into session in Houston February 25 and to make a preliminary progress report by the end of the week. Its membership included: T. E. Swigart, of Houston, president of Shell Pipe Line Company, as chairman; Charles Fitzgerald, of Fort Worth, Sinclair Refining Company; B. E. Hull, of Houston, president of Texas Pipe Line Company; J. L. Latimer, of Dallas, Magnolia Pipe Line Company; and G. L. Rowsey, of Taylor, Taylor Refining Company. The subcommittee was asked to recommend procedures by which the transportation needs of District 3 could be met as efficiently as possible, with minimum use of new materials, and by which crude oil and products could be moved as effectively as possible toward the East Coast.

The subcommittee was advised to consider utilization of existing pipe lines in such manner as to serve most effectively the essential refineries, terminals, and producing areas. And it was pointed out that this might involve such unusual measures as (1) moving some existing pipe lines for use elsewhere or (2) the conversion of gas lines to oil lines for emergency movement. The subcommittee also was advised to consider the necessity of eliminating cross-hauls by tankers and barges and to free as much of this equipment as possible for movement east.

The other subcommittee of the Transportation Committee of District 3 appointed by Wiess was that on tankers, composed of J. H. Wood, Jr., of Dallas, Atlantic Pipe Line Company, chairman; Maston Nixon, of Corpus Christi, Southern Minerals Corporation; and R. W. Pack, of Beaumont, Sun Pipe Line Company. The group was due to meet in Washington on February 26 with H. A. Gilbert, director of transportation in the Office of Petroleum Coordinator, and with members of the Tanker Coordinating Board to study the tanker situ-

Weekly East Coast Refining and Stock Trends

Week Ending	Refinery Runs, Daily Average	Gasoline Production	Stocks of Finished & Unfinished Gasoline	STOCKS OF FUEL OIL			
				Gas Oil & Dist. Fuels	Residual Fuel	Total Stocks	Percent of January 3 Stocks
Jan. 3	668,000	2,000,000	20,118,000	19,132,000	11,933,000	31,065,000	100.0
10	603,000	1,685,000	19,863,000	17,728,000	11,053,000	28,781,000	92.7
17	565,000	1,644,000	20,361,000	15,742,000	10,109,000	25,851,000	83.2
24	603,000	1,700,000	19,812,000	14,207,000	9,615,000	23,822,000	76.8
31	618,000	1,820,000	19,536,000	13,400,000	8,789,000	22,189,000	71.4
Feb. 7	583,000	1,715,000	19,343,000	12,756,000	8,573,000	21,329,000	68.7
14	513,000	1,419,000	19,317,000	10,328,000	8,586,000	18,914,000	61.0

Figures from American Petroleum Institute. Stocks of fuel oils, at refineries, bulk terminals and in pipe lines.

ation. The tankers subcommittee was instructed to give special consideration to needs of all Gulf Coast refiners, especially those supplying defense products. It is to include in its report recommendations for meeting the needs of such refiners and to advise whether in its opinion allocation of tankers should be employed, and if so, the best method of establishing allocations, in order that this matter might be presented to the National Transportation Committee and the Petroleum Industry War Council on March 2 and 3, and subsequently to the Petroleum Coordinator. The subcommittee was asked to indicate how the Transportation Committee of District 3 might best discharge its duties in the matter.

Dig Up Texas Lines?

Two proposals for alleviating the East Coast oil shortage were particularly in the limelight last week, although numerous others also were generally discussed. They were: (1) digging up some of the lines between East Texas and the Gulf Coast for use in building a line eastward, and (2) conversion of some natural gas lines of the Southwest and Southeast into oil lines.

The first of those proposals was advocated by Jerry Sadler, member of the Texas Railroad Commission, who said that 14 East Texas-Gulf Coast lines were in operation and that some could be moved, while capacity of others could be pooled to maintain movements to the coast.

"Convert Gas Lines to Oil"

The proposal to make use of existing gas lines for handling oil was believed in some quarters to have important possibilities although engineers familiar with operation of both oil and gas lines doubted if it would be found practicable to undertake conversion of lines upon a large scale. Meanwhile, no investigation of practical value had been made as to the economic and technical problems that would be involved in the suggested falling back on existing gas lines for help in alleviating the East Coast oil shortage.

In suggesting that gas lines might afford help, it was stated that perhaps some of the parallel gas lines between Southwest Texas and the Texas Gulf Coast and East Texas might be converted to oil, and that capacity of remaining lines might be stepped up by addition of compressors, and that greater use might be made locally of gas from Gulf Coast and Southwest Texas fields. Similarly, it was suggested that some of the gas lines leading across Louisiana and Mississippi into Tennessee, Alabama, and Georgia, perhaps might be used for carrying oil on eastward, and that industries in those areas could revert to coal. It was conceded, however, that some of the industries of the Southeast might have disposed of their coal burning equipment, and information was lacking as to the extent to which those industries engage in war production. Attention was called to the fact that gas companies are connected into numerous fields from which they take only comparatively small volumes of gas, and it was said capacities of main gas lines are not fully utilized. But representatives of gas companies who were contacted said it was necessary to be connected to numerous fields in order to take care of seasonal and occasional heavy loads, with demand fluctuating widely. Likewise, they stated, trunk lines must have large capacities available at all times, although the full capacity is not constantly used.

In the speculations, it was assumed that cutting off of gas from some, if not numerous, domestic consumers would be unavoidable, but that wood, coal, kerosene, and other fuels could be substituted. However, gas men warned that much trouble would arise from such disruption of domestic fuel set-ups, affecting many homes, and requiring new cooking and heating equipment.

Several engineers of oil and gas pipe line companies were questioned as to the mechanical practicability of using gas lines for service in oil pipe line systems, and they cited two major obstacles that would be involved. (1) Most of the gas lines are low pressure, they said, and those lines could not be operated at the pressures of 800 or 900 pounds which are common in operation of oil lines. Walls of the gas lines are relatively thinner, valves are lighter, and many of the gas lines have rubber couplings that make them undesirable for handling oil. In contrast with the gas lines, oil lines must be able to withstand higher pressures, as handling of a fluid involves pulsations from pumps and a hammering effect when valves are turned, whereas gas lines are not subjected to such sharp jumps and drops in pressures. Furthermore, it was stated, many of the gas lines if dug up for use elsewhere would be found corroded and pitted and especially undesirable for use in oil pipe line systems. (2) The other major difficulty of converting gas lines into oil lines, it was stated would be the necessity of substituting pumps, tanks, and other scarce equipment and materials instead of the compressor stations used in handling gas; although the oil industry doubtless is not making maximum use of the pumps and tanks that it has.

★ OIL IS AMMUNITION ★ ★ KEEP 'EM PRODUCING ★

"Relax Anti-Trust Laws"

Probably the greatest possibility for stepping up overland movement of oil to the East, in the opinion of some oil industry executives, is that of legislative dissipation of all the fears of anti-trust prosecution that still make oil men hesitate to act in concert in handling the transportation problem, as brought out in the recent hearings of the Cole committee, some of the things that the petroleum coordinator is finding necessary or desirable for the industry to do in the emergency are authorized by OPC and the Department of Justice but yet the powers of those administrative agencies to make such authorization are not set forth in laws enacted by Congress. Consequently, both the petroleum coordinator and the oil industry are in the position of having the anti-trust laws hanging over their heads, despite action in accordance with the obvious wishes of Congress and the people. Better coordination of the industry's facilities could be achieved, it is contended, if the oil companies were specifically and clearly exempted by Congress from some of the provisions of the anti-monopoly laws.

Caliper Logging In the Southwest

By C. P. PARSONS, Vice President
Halliburton Oil Well Cementing Company, Duncan, Oklahoma*

THE open hole in a well no longer is the "blind spot" of the oil fields.

Before the recent introduction of caliper logging, fieldmen, engineers and geologists were constantly groping in the dark with problems in which the physical size of the hole was involved. There were many such problems and sometimes there were as many different mental pictures of the same hole as there were men working on a problem.

Briefly, caliper logging is a practice of measuring the variations in diameter of the open hole. The writer has just presented a paper[1] on caliper logging in general but it will be attempted herein to discuss some caliper logs from wells in the geographical area embraced by the southwestern district of the American Petroleum Institute.

Starting with the grass roots in a well to be drilled in the Gulf Coast, for instance, the first problem in which the diameter of the hole is involved is where to set surface casing. One's immediate impression is that this does not directly involve the diameter of the open hole. Several caliper logs taken in a field in Southern Louisiana show that all the formations in the upper part of the wells wash out, whereas below a certain depth the sands have a tendency to stand up to bit size but the shales wash out. This transitional point appeared to be a logical depth to set surface pipe in that field and it is being done accordingly.

The next problem is how much cement to place behind surface casing. Due to the hazard of blowouts from high pressure gas frequently encountered in the Gulf Coast, the proper selection of depth to set surface casing and the proper amount of cement to place behind it become very important. At any moment during a blowout the surface casing may become the sole defense against cratering, the most destructive hazard in the oil fields. Besides successful prevention of cratering it may also be necessary to attach an emergency connection to the top of the surface casing through which the wild well may be killed by pump pressure. It is obvious therefore that surface casing should be anchored as securely as possible in areas which produce high-pressure gas. The physical measurement obtained by caliper logging not only assists in determining the proper depth for setting surface casing, but it is the only way of determining how much cement will be required to fill the space behind the casing. It may not be necessary to run a caliper log in every well for this purpose, but enough of them could be run to establish a casing and cementing program in the early development of a field.

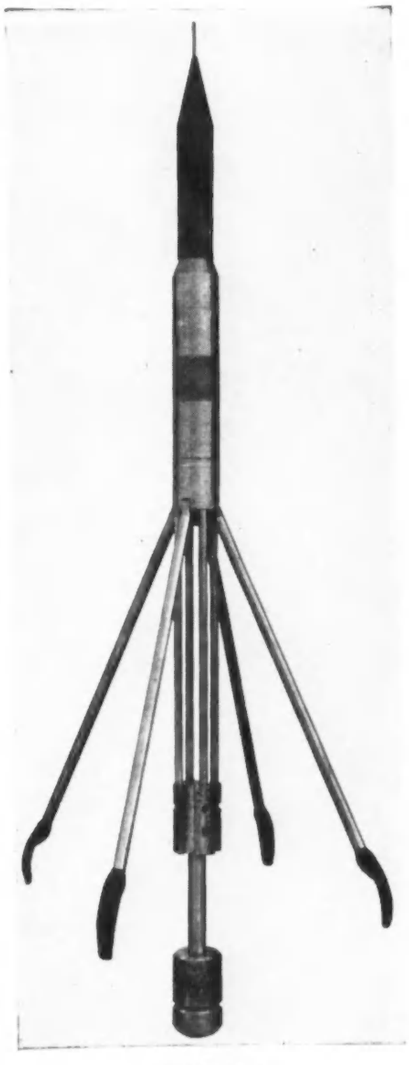


FIGURE 1

While drilling below the surface casing there are numerous problems in which the diameter of the hole is involved.

One of them is the failure of tool joints due to excessive wobble of the drill string. This has a definite relation to the size of the open hole. Future progress in deeper drilling is partially dependent upon solving this problem. So far, the problem has been studied from the standpoint of materials and design used in the drill string. Caliper logging now makes it possible to study the relation of the varying sizes of open hole to the wobble of the drill string and to study results of various drilling techniques.

Several problems involving abnormal hole size while drilling may be caused by certain formations such as highly bentonitic shales which may reduce the size of the hole. The effects of some of these troublesome formations have already been measured by caliper logging and the information obtained has been helpful in overcoming the problems. Some caliper logs of salt sections are included in the illustrations accompanying this paper and are described later.

The prime object of drilling a well, wildcat or otherwise, is to find a commercially productive for-

* This paper was presented before the Southwestern District, American Petroleum Institute Division of Production, at Dallas, February 27-28, 1942.

[1] Annual Meeting, American Institute of Mining & Metallurgical Engineers, New York City, February 10, 1942.

mation. When drilling a well that is inside production it may not be necessary to look for new productive horizons, nor to hesitate about setting the production string of casing. But in edge wells and in wildcat wells one is forced to think twice before risking an expensive string of casing without assurance of commercial production. Aside from the expense, the setting of casing restricts further drilling. A formation tester is usually run for the purpose of determining the productivity of a formation without running casing but its chance of success is very definitely related to the size of the open hole. Caliper logging is already clearing up a lot of problems encountered in formation testing by showing why failures have occurred in the past and providing information that will greatly increase successful results in the future.

When a productive formation is shown to be commercial by a formation tester a string of casing is run and cemented. In the old days when the wells were comparatively shallow the cement usually had the single purpose of getting a primary water shut-off around the casing

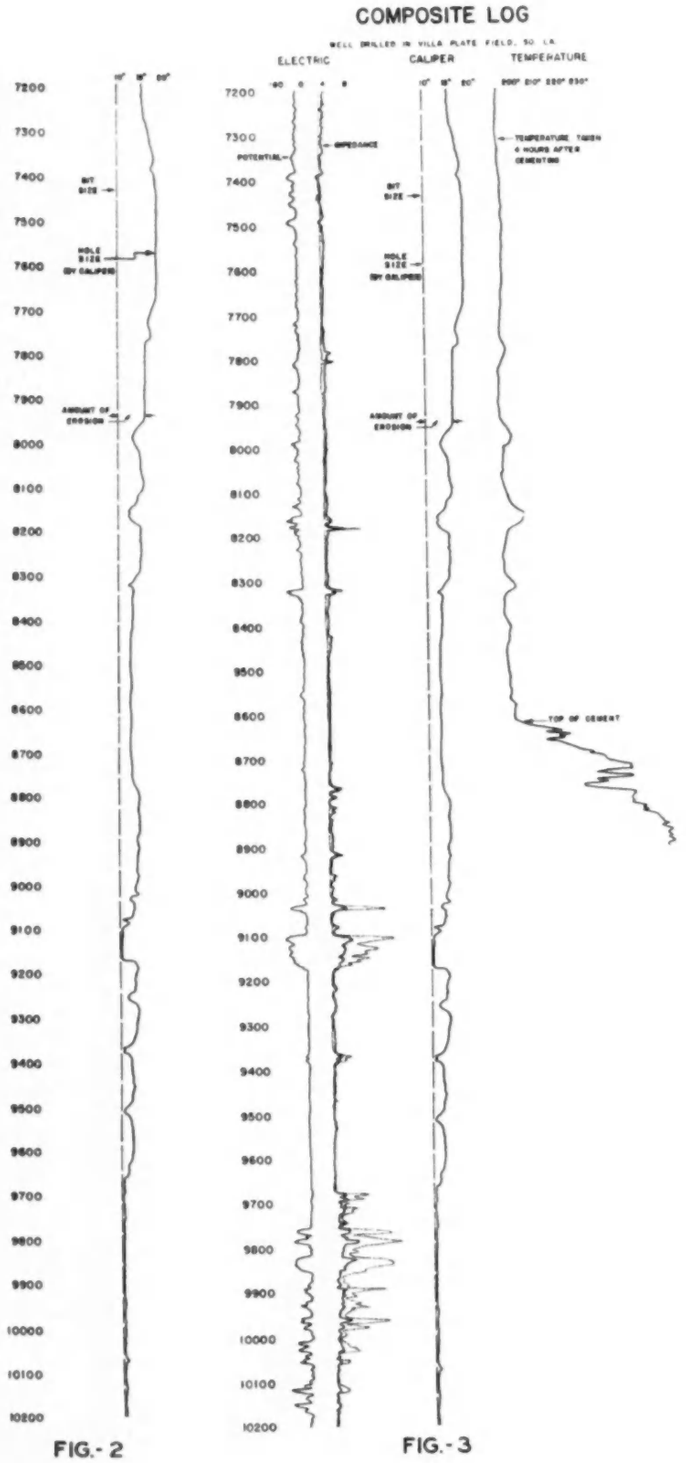


FIG.- 2

FIG.- 3

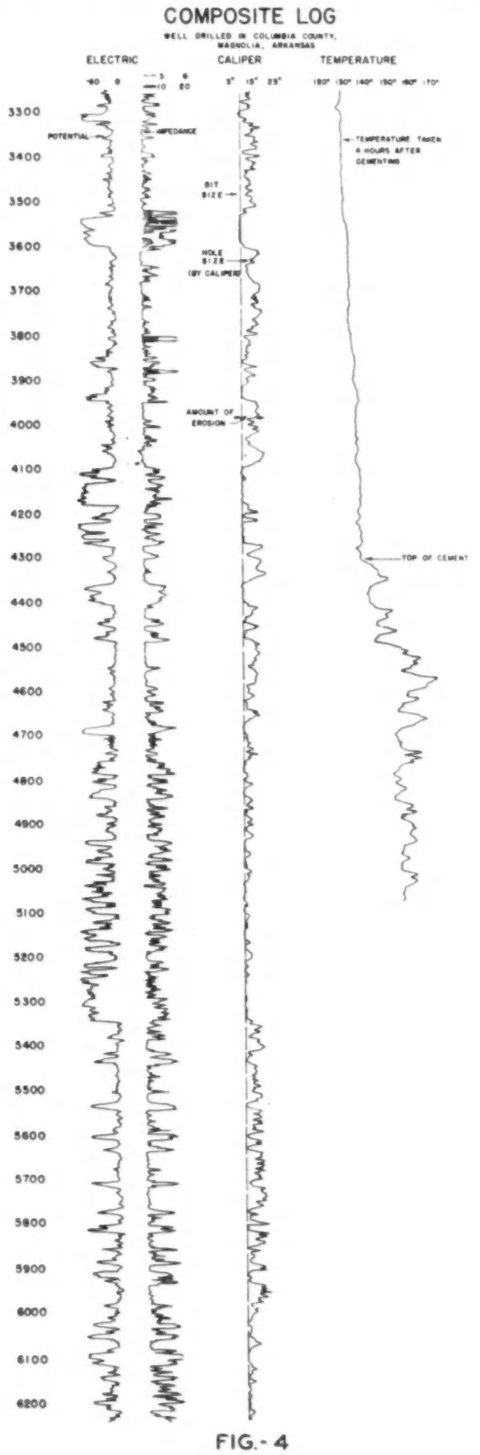


FIG.- 4

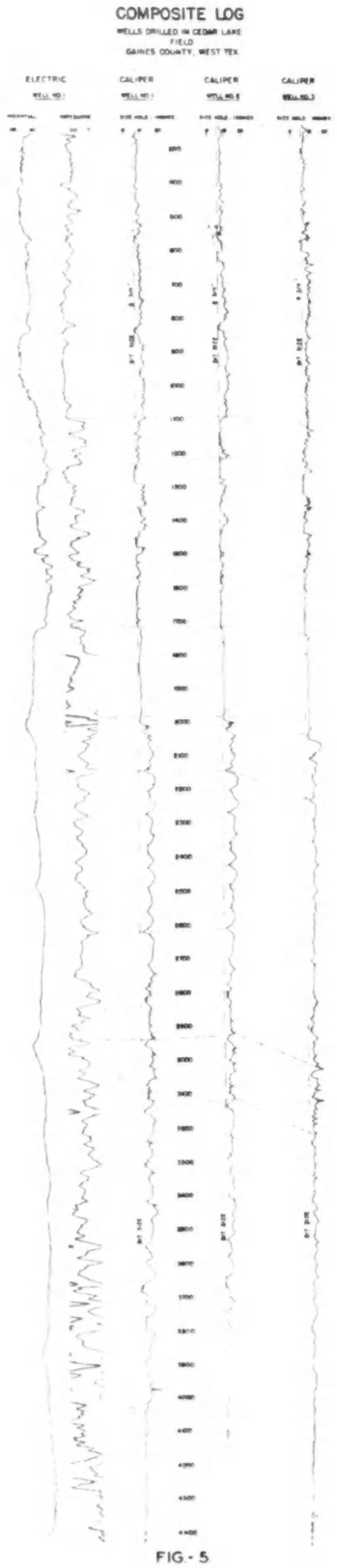


FIG. - 5

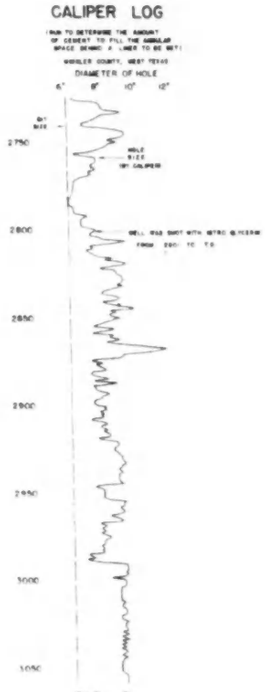


FIG. - 6

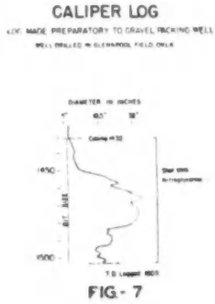


FIG. - 7

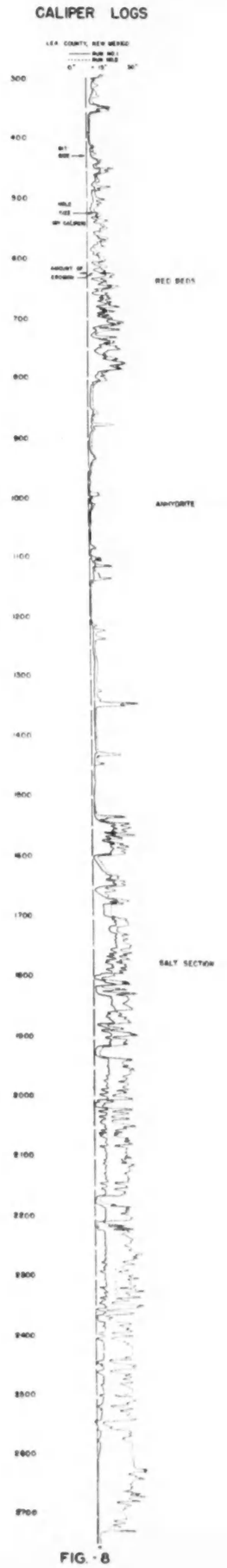


FIG. - 8

shoe. Deeper drilling brought these additional purposes for the cement: to reinforce the casing against collapse; to seal off corrosive water behind the casing; to conserve shallow productive formations; etc., etc. It became necessary to place cement up to a definite height behind the casing instead of just around the shoe but there was no definite way of knowing how much cement to use. Consequently a lot of guess work was involved. It was possible to locate the level of the top of the cement by thermal means after it was in place, but that was too late. Caliper logging now provides definite knowledge of the volumetric capacity of the annular space behind the casing up to any height.

After casing is set there may still be need for the information obtained by caliper logging.

If the producing formation is to be gravel packed, a caliper log will not only show the amount of gravel required, but will also show any irregularities in the shape of the hole to be packed.

If the producing formation is shot, a caliper log will show the effect of the shot on the diameter. Logs already taken show wide variations in diameter after a shot.

If the producing formation is in an area which responds to acidizing, successive caliper logs taken before and after acidizing may show that the acid is entering a thin streak of high permeability, leaving untouched the portion of low permeability which really needs the acid. Logs already taken have shown this condition and it was possible to follow up with the selection of a packer seat and the squeezing of acid into the portion of low permeability.

If the producing formation later needs plugging back to shut off bottom water, a caliper log will show the volumetric capacity of the portion of the hole to be cemented.

If it becomes necessary to run an open-hole packer in the well, a caliper log will show the possible places where the packer can be set and the amount of expansibility that will be required of the packer.

Figure 1 shows a type of open hole caliper now being used in the field. It is run into a well with the arms in closed position and when it reaches the bottom of the well or some other level where caliper logging is to begin, the arms are released by an electrical means and opened by spring tension. The four arms are mechanically independent of each other. The caliper is run into a well on an electric cable. When it is pulled upward through the open hole the four arms ride gently against the well of the open hole. The variations in diameter of the well are measured by electrical means connected to the upper ends of the arms and the recording is made directly in inches at the surface. Measurements are obtained at rates up to 100 feet per minute, depending upon conditions in a well. It is not necessary to remove the drilling mud, oil or water from the open hole as they do not affect the operation.

Figure 2 shows an actual caliper log taken in a 10,000-foot drilling well in South Louisiana prior to running casing. The Wilcox sands are in the lower part of the hole. The purpose of running this log was to determine the volumetric capacity of the space which will be behind the casing so that the proper amount of cement could be used to cover the Haas sand and Tate sand located upward in the hole and which later may be produced by perforating the casing. According to calculations based on the size of the bit which drilled the hole and the O.D. of the casing it would require only 400 sacks to fill the annular space up to the proper level. According to caliper measurement it required 1250 sacks. Previous wells drilled in the same field failed to get proper fill-up and several squeeze jobs were necessary to repair a condition which was attributed to channeling. The caliper log shows that the 525 sacks plus the usual amount donated to the hole would hardly reach the upper sands. A thermal log taken after the casing was cemented with the 1250 sacks calculated from the caliper log, showed that the cement reached its intended height. Similar caliper logs and cementing calculations based thereon will eliminate the volumetric capacity factor which in turn will yield information about channeling and thief formations. For instance, if a caliper log shows a certain amount of cement to fill to a certain height and the cement actually reaches a considerably higher level then there is evidence of channeling. If, on the other hand, the amount of cement calculated by the caliper log fails to reach the proper height then there is evidence of a thief formation. In the past, every problem of fill-up was attributed to either channeling or a thief formation in the absence of any information about the volumetric capacity of the hole.

Figure 3 embodies the same caliper log as in Figure 2 but also includes the electrical and temperature log taken in the same well for the purpose of comparing physical, electrical and thermal values. While the caliper log taken in this well was for the purpose of determining the amount of cement to be used, it also provides other information relative to the stratigraphic profile. One glance at it shows that it changes the usual conception of open hole in the Gulf Coast. Due to the fact that Gulf Coast sands have been generally classified as loose and unconsolidated and screens have had to be used to keep the sands from flowing into producing wells, the general picture of an open hole was that the sands washed out and the shales were closer to bit size. The caliper logs taken in the Gulf Coast show that below a certain depth the shales wash out and the sands are closer to bit size.

Figure 4 shows a caliper log embodied in a composite log taken in a well in Magnolia, Arkansas. Again the shales wash out and the sands stand up closer to bit size. This information was very essential in determining volumetric capacities and it also shows where formation testings could have been made, where packers could be set, where side wall cores could be taken, etc., etc. It also shows a definite relation between the variations in all three values, namely, electrical, physical and thermal. The temperature log was taken four hours after the cement was placed and the variations in temperature below the top of the cement are due to the variations in heat losses from the cement into the formation opposite sands and shales. A drop in temperature indicates a change from shale to sand and an increase in temperature indicates a change from sand to shale.

Figure 5 shows three caliper logs taken in wells in the Cedar Lake field in West Texas. The primary purpose of these three surveys was to assist in understanding why several strings of casing had collapsed at 2800 feet. Due to the shallow depth it was felt that the collapse was not due to hydrostatic pressure. There is a salt section behind that part of the casing and it was felt that the collapsing was caused by some shifting condition in the

[*Continued on page 34*]

Improvements in the Treatment of *Crude Oil-Water Emulsions*

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THE author discusses the improvements that have been made during the last several years in the art of handling and treating oil-field emulsions. These improvements include wider dissemination of knowledge of the subject, better chemicals, and new equipment, most of which was designed for this particular work. The definite but very limited present application of superdehydration and desalting in the field is summarized. The separation of gas in emulsion-treating plants is discussed briefly. The need for continuous study is pointed out.

Presented at the Southwestern District meeting of the American Petroleum Institute at Dallas, February 26 and 27. The original paper contained illustrations of the principle type of treating units.

THE art of handling and treating oil-field emulsions, although as old as the industry, is studied continuously with the natural result that worthwhile improvements are made. Producers seek to lower the installation and operating costs of treating systems but the problem has a much broader aspect. Refiners cannot tolerate high salt contents in the crude charged to newer types of refinery units as the shutdowns and depreciation of equipment caused by scale depositions and corrosion are costly. Pipe line companies have to contend with evaporation losses and the accumulation of unmerchantable tank bottoms. It is thought that the producers cannot or should not be held responsible for these ills, but it is the author's purpose to point out some of the more recent trends and practices that have a bearing on this general problem.

The average oil-field employe's knowledge of oil treating has increased materially within the last several years. This is a result of more experience and of expanding training activities of the companies involved and by the state vocational agencies. These efforts are well supplemented by publications prepared by the United States Bureau of Mines[1, 2, 3], and by the individual contacts made by representatives of manufacturers of equipment and chemicals. Most operators have learned that the oil-treating problem is such that a complete standardization of equipment, chemicals, or methods is not practical and that each field and often each well is an individual problem. Many of them also find that their oil-treating costs reflect the amount of work done to improve their treating operations, by study and by adaptation of newer methods.

The theory of treating oil-field emulsions when reduced to its simplest concept shows that two things must be done, and they are: first, the water globules must be coalesced; and, second, the water and oil must be separated. The main factors that affect the first include:

1. The physico-chemical conditions.
2. The temperature.
3. Time.

Assuming that coalescence is practically complete, the main factors that affect the second include:

1. The degree of agitation in the settling chamber.
2. The temeprature.
3. Time.

This brief theoretical outline for successful treating has been found usually to aid production men in their analyses of treating problems more than would their thorough study of the physical chemistry involved[4, 5]. The most difficult part of any treating job is to obtain the desirable physico-chemical conditions and to determine the optimum temperatures to suit those conditions. The separation of coalesced water from the oil depends mainly on the design and the mode of operation of the treating equipment. The difference in specific gravities and viscosities of the oil and water and the degree of emulsification are usually the first elements determined in a practical approach to a new treating problem. The action of chemicals must be studied to determine their reaction rates on the emulsion in question and the degree of completion of the reaction at both natural and elevated temperatures. There should be no agitation in the settling chamber in a well-designed plant; however, it is often possible that agitation can be overcome by chemical means, although not always economically.

The companies that manufacture treating chemicals have maintained a vigorous research program in recent years and better chemicals are available than at any time heretofore. Some of this work, by necessity, is done in field laboratories often housed in trailers in order that fresh emulsions can be studied on the lease. These newer chemicals have been a help in several ways. It has become possible to eliminate heating in quite a number of fields, in cases where it is desirable to do so, by using suitable treating compounds. They have generally reduced the time necessary for the completion of their action on emulsions, thereby reducing the size of settling tanks; or, in existing plants, they obtain a lowering of the impurities content of treated oil. There are some physical and mechanical problems in treating that can never be overcome by chemical means, but, on the other hand, it is thought that too often the chemical consumption is criticized while equipment design weaknesses that can be corrected are disregarded.

Chemical Lubricators

The point of injection and the proportioning of chemicals are important phases of any treating operation. Surfluh[6] has discussed the point of injection and the use of

beam-operated and of electric-motor-driven chemical pumps. Several satisfactory gas-operated chemical feeders have been developed and are being widely used to advantage, particularly for treating gas-lift and the flowing production. Some inject the chemical at the well ahead of the choke. The gas used to actuate the feeder is taken from the riser above the tubing. On larger leases it is usually the practice to use this type of feeder but to inject the chemical at the flow-line manifold ahead of the gas-oil separators. Studies made to determine the proper points of injection and methods of feeding usually result in worthwhile chemical and labor savings. The nature of the chemical and the emulsion, the reaction rates between the two, and the degree of agitation must also be taken into consideration in such studies.

Gunbarrels

The old conventional gunbarrel with its flume or boot will probably always be a standard treating arrangement for certain types of crudes and emulsions. It is best adapted to low-viscosity and low-cold-test crudes. Its advantages are that a reasonable volume of untreated oil can be stored and that a relatively long settling time is available. This long settling time is especially desirable if the most effective chemicals available have a low rate of reaction.

In a well designed gunbarrel the flume size has been found to be an important consideration, as its primary purpose is to permit a final gas-oil separation at close to atmospheric pressure. Gas not separated becomes an agitating agent in the settling zone and prevents the quiet settling, which is essential to obtaining optimum results in any emulsion-treating system.

The advantages of the gunbarrel system diminish when the type of crude or the physico-chemical conditions are such that heating is necessary. It is imperative that heaters installed have sufficient capacity and that the mode of operation is such that uniform temperatures are maintained the year around. This is not an easy problem when we consider the fluctuations in atmospheric temperatures throughout most of the year in this area. No entirely satisfactory system using gunbarrels and heaters has been devised for general use, although in individual cases economical results are obtained.

There is nothing new in heating principles, but there has been a worthwhile improvement in the design of heaters for gunbarrel service and for heating oils that congeal or become too viscous at low temperatures.

The "volume-type" heater with removable internal fireboxes is being widely used and is highly satisfactory because of high capacities and efficiencies and low maintenance costs. If a tendency toward scaling exists, excessive depositions are prevented by thermal expansion and contraction of the fire tubes or by periodically pumping crude oil or tank-bottom accumulations through the unit. It is necessary to have water above the tubes to prevent coking of oil, as coke on the fire tubes acts similar to scale and causes blistered tubes.

The water-bath, coil-type heater was developed to heat high-pressure gas, but is now finding wide application in handling congealing oils, for heating emulsions when installed between the oil-gas separator and the gunbarrel, and for heating corrosive fluids usually in conjunction with wooden gunbarrels. For heating either gas or fluids essentially free of gas, it is practical to use helical coils, but if the heater is installed ahead of the separator or in corrosive service, coils containing straight pipes are more practical. Oil and gas separation in helical coils can cause severe vibrations. Heater units containing straight pipes are easier to build and repair when it is necessary to use corrosion-resistant materials.

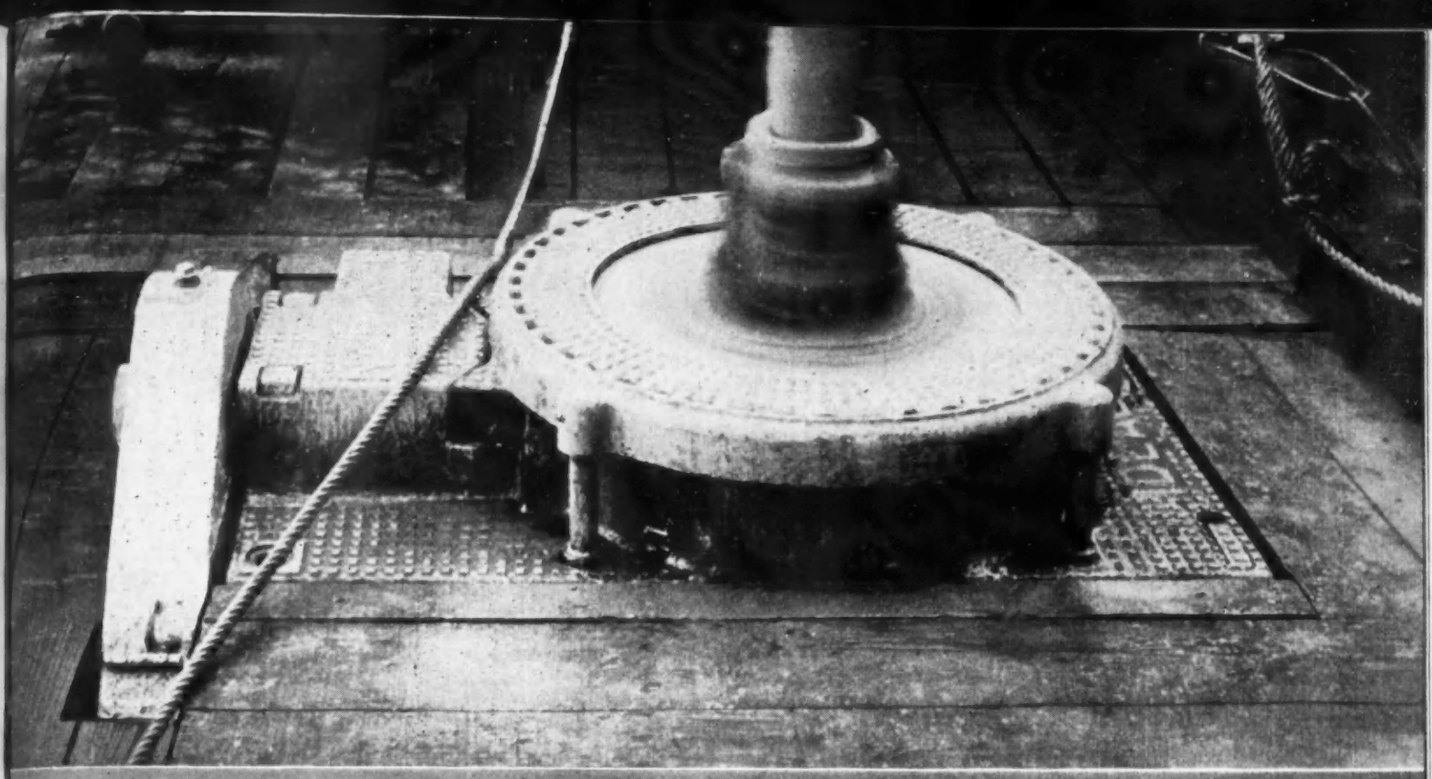
Unit Treating Plants

Until recent years it was the practice in the industry to build treating plants using equipment originally designed or used for other purposes or even fabricating something to do the job, using whatever materials and obsolete equipment that could be found in the junk pile. Sometimes this is an economical procedure. In cases where emulsions do not have to be heated during treatment, the practice of converting a stock tank into a gunbarrel or building a suitable size gunbarrel, is undoubtedly a sound economic practice. When heating is necessary, the picture is often changed. The trend lately has been toward the use of flow treaters, as they are commonly known, wherever heat is required. Perhaps the first unit type of equipment that was designed for use solely to handle and treat emulsions was the electric dehydrator. It, of course, in some cases required the installation of heaters and heat exchangers. Flow treaters depending on the action of heat and chemical have been under development for several years, and it is possible at this time to obtain units of different types and having individual characteristics that make it possible for the producer to select a treating unit to fit his particular problem. These flow treaters combine in a single unit some or all of the following items: heaters, wash tanks, settling tanks, gas-oil separators, free-water knockouts, and heat exchangers. They are usually equipped with thermostat controls and automatic water bleeders.

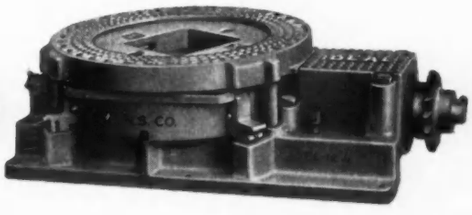
Typical flow treaters employing chemical and/or heat separate the gas, oil and water produced from wells producing emulsion while the pipe-line oil produced from other wells on the lease are handled through the conventional gas-oil separator. This system of handling and treating emulsions allows the producer to closely regulate treating temperatures and the separation of oil and gas without requiring high labor costs. On leases where emulsions can be treated by heat alone, the system has no apparent disadvantages. Where heat and chemical are required, it is necessary to give reasonable care to the selection and feeding of chemicals in order to obtain optimum results.

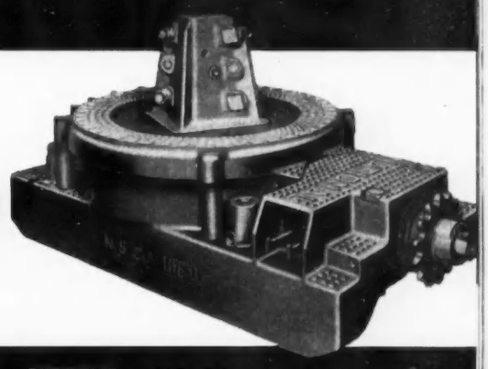
This type of equipment appears to be the answer in many cases to one of the hardest problems that producers with low lease allowables have to face. It is a comparatively easy matter to design treating plants to handle large volumes of emulsions, economically; but, when a producer has a dozen or so leases, each one of which has an allowable of only 20 to 100 barrels per day, it is difficult to keep per-barrel installation and operating costs down and still have a plant that could handle a large volume of oil. A great deal could be said about selecting equipment that fits the individual problem in order that operating costs be not excessive.

Shea[3] has discussed the operation and characteristics of some of the older flow treaters. A flow treater designed about a year ago is in wide use at present and employs some new principles found to have considerable merit over older treating systems in most fields. The unit consists essentially of a shell containing four internal flumes and an internal heater. The



• • • The world's record for drilling depth and many records for drilling speed are held by Ideal Rotary Machines. We believe they have made more records... both for depth and speed... than any other make. These remarkable performance records are largely responsible for the wide acceptance of Ideal Rotaries in every oil field.





IDEAL MS-27½ Rotary Machine

This is National's machine with the largest size opening to meet field requirements for setting large surface strings through the table. Supplanting the well-known Type FE-27½-B, which has given so many years of excellent service, this rotary is for speeds up to 350 r.p.m. at any known depth.

IDEAL FE-12½ Rotary Machine

This machine has been designed to meet the need for a sturdy, short-coupled unit for portable work. Because of the short centerline distances available—either 36" or 44" between center of table and sprocket—it is particularly adaptable to truck or trailer mounted "slim hole" drilling rigs. Many outstanding features of the larger types are incorporated in this machine, its drilling capacity permitting its use on many conventional rigs.

IDEAL SHS-20½ Rotary Machine

The Type SHS-20½ is an improvement over the HS-20½ Rotary, which has been so universally popular and has pioneered high speed drilling. With drilling speeds now exceeding 500 r.p.m., National is meeting the demand with this superspeed machine. It is designed to meet the need for the highest speeds required and at the same time to carry the longest drilling strings.

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result of this rather simple arrangement is that two gas-oil separations are provided and no gas can agitate the fluid in the settling section. Unusually efficient "water washing" of the oil is obtained without resorting to excelsior or baffle systems. The two-stage gas-oil separation at the same pressure but at different temperatures makes this phase of the operation unique. Fluid enters the top of the flume No. 1, in which free water settles out and where the cold gas is separated. The emulsion spills into flume No. 2, which conducts it to the heater section and into flume No. 3. The fluid releases any gas liberated as a result of heating when it spills from flume No. 3 into flume No. 4. Flume No. 4 conducts the fluid to the lower part of the settling compartment. Water is bled automatically from flume No. 1 and from the settling compartment by pressure-equalized "syphons" which are set at a predetermined height. Adjustable syphons can be used but have been found to be generally unnecessary. The temperature of the water in the heating zone is thermostatically controlled and the gas pressure in the vessel is regulated with a conventional back-pressure valve. Approximately 65 percent of the entire volume of the vessel is used for settling. The heat exchanges established in this system result in cooling the treated oil and increasing the capacity of the heater.

Free-Water Knockouts

One type of equipment that deserves mention because of its wider use is the free-water knockout. This is merely a chamber or low-pressure vessel equipped with an automatic bleeder and installed ahead of heaters to remove water which is not emulsified with the oil. The use of such equipment is often economical where fuel gas must be purchased or on large leases as a means of reducing the load on existing heaters. A combination heater and free-water knockout is also being used in several fields.

Gas-Oil Separation

An important phase of the operation of any treating plant where heat is used is the gas-oil separation. Heating, of course, tends to reduce oil gravities by liberating the lighter ends of the crude, and producers are paying increasing attention to such operation. The optimum results depend on whether the field is served by a gasoline plant, type of treating plant, nature of the components in the gas-oil mixture, crude prices, and several other factors. From an over-all conservation standpoint, where a gasoline plant is used, the oil should ordinarily be stabilized to some reasonable degree to reduce pipeline losses and the lighter ends of the crude should be sent to the gasoline plant for recovery. Often, several stages of gas-oil separation are desirable.

Table 1 shows the nature of the data collected in testing the operation of a treating plant in which the gas-oil separation is carried on in conjunction with the water-oil separation. Although this is actual data taken from a plant in the East Texas field, it is presented here only to emphasize the importance of the need for observing temperatures and pressures and to illustrate the type of data used to study the characteristics of individual treating plants to compare the different types when the gas-oil separation is an important question.

Studies of this type have proved that relatively high temperatures can be used in some types of plants without sacrificing control over gas-oil separation. This is especially important to the operator in many fields that are not served by gasoline plants.

Superdehydration and Desalting

Several of the larger producing companies became salt-content conscious during the last two years and various field experiments were made in an effort to reduce the salt contents of crude which already met pipeline specifications. These experiments followed two different trends of thought. One thought was that emulsions should be superdehydrated, that is, treated to as low a water content as is possible in a single operation. The other thought was that the treated oil should be desalted in the field.

Superdehydration was accomplished in one of two ways. In some cases it was found that by carefully selecting chemicals and methods, the oil could be treated consistently to 0.1 percent and less impurities with a resultant salt content of 15 to 30 pounds per thousand barrels of oil. Although it was found that this is not a universally practical operation, it is an economical practice in fields where the adaptability of chemicals and methods make it possible and where the crude is segregated during transportation to the refinery. The second method tried was that of adding fresh water to the emulsion and separating the oil and water in conventional treating plants. This has not been very satisfactory, although salt contents can be greatly reduced. The main objections to the method appear to be the cost of fresh water and additional heater capacity, and the need for regulating the ratio of the volume of fresh water to the volume of production.

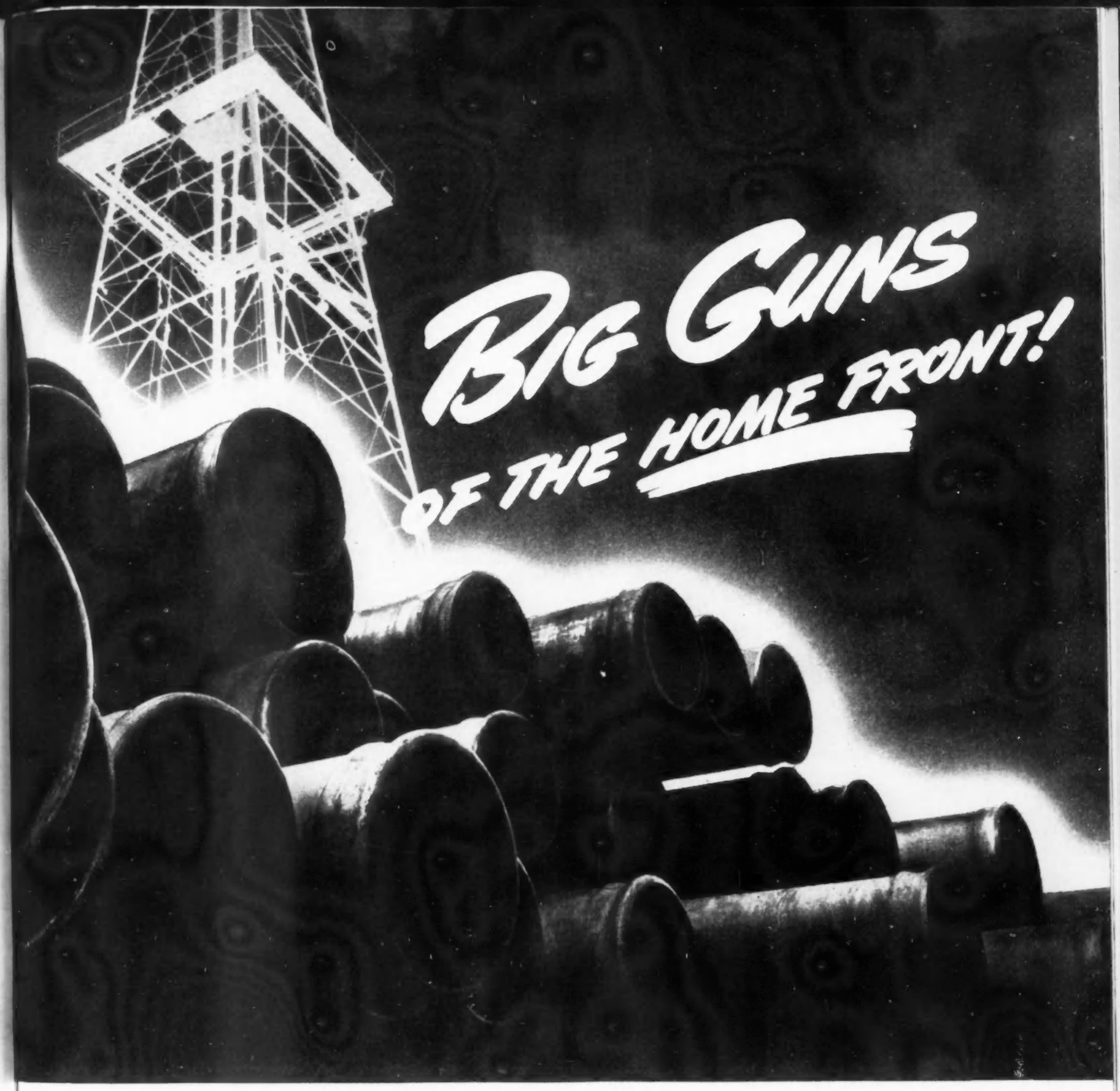
Desalting in the field appears to be generally uneconomical because the required additional installation and operating costs do not compare favorably with the costs obtainable by electrical and chemical methods in refineries. An exception to this is where all the production in a field is brought to a central location and treating and desalting can be carried out in conjunction with the operation of a gasoline plant. An outstanding example of such an operation is carried on in the Ville Platte field in Louisiana.[7]

Practices which obtain low salt contents appear worthwhile when some particular crude is not contaminated with less clean crude during transportation. The practice is feasible in some cases as a means of reducing corrosion of pipeline equipment and tankers. In general, however, producers have no economical methods available which can be used to treat relatively small volumes of oil to low salt

TABLE 1
Data on Gas-Oil Separation in a Treating Plant

Test No.	Approx. Rate Prod. Bbl./Hr.	No. of Stages	Separator Pressure Lb./Sq. In.—Gauge			Temperatures—Degrees F.					
			1st	2nd	3rd	1st	2nd	3rd	Oil to Stock	Atm.	Net G.P.M.
1	110	1	0	...	..	77	...	...	77	85	4.12
2	110	2	0	0	..	77	140	...	112	85	4.56
3	105	1	0.5	...	..	80	...	...	80	98	4.04
4	105	2	0.5	0.5	..	80	140	...	114	98	5.30
5	110	1	3.5	...	..	75	...	...	75	79	3.14
6	110	2	3.5	3.5	..	75	140	...	110	79	3.60
7	80	1	0	...	..	76	...	...	76	91	4.40
8	82	2	0	0	..	82	138	...	115	94	5.80
9	70	3	9.0	0	0	85	85*	138	119	95	5.12
10	60	2	0	0	..	87	148	...	115	95	5.80
11	70	3	0	0	0	87	87*	147	118	95	5.00

* Estimated—shown to indicate no heating between first and second stages.



's 3,000 miles, as a P-47 flys, from Pittsburgh to San Luis Obispo. And the *home front* begins at either end and lies all he way between.

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contents. For the present, the refiners who have cheaper water, heat, and power available will have to continue to do their own desalting.

Salvaging Oil

Practices that waste oil are gradually disappearing, even though some producers still burn all of their tank bottoms. Thoughful operators often spend money to salvage oil which only a few years ago would have been run to the burning pits. In two of the larger Gulf Coast fields a major operator, developing these pools, installed 750-barrel gunbarrels on each lease so that in bringing in new wells the first several hundred barrels of oil from each well could be separated from the mud and wash water and run to stock tanks. In West Texas and New Mexico, most operators salvage as much oil as is practical from the rather large volumes contaminated during acidizing operations. A critical economic study of such practices reveals that operators must be prompted by something other than the desire for immediate return on the investment. Regardless of how carefully oil is treated and especially in fields where paraffin accumulations are common, high bottoms occur. It has been learned that it almost always costs less to recirculate such tank bottoms through the treating plant than it does to burn them, even though no additional oil allowable is obtained.

Conclusion

Those familiar with the emulsion-treating problem know that the factors involved are continually changing. Each field is a new oil-water system and should be handled accordingly. The fact that the emulsions are satisfactorily handled in one field in a certain manner does not insure success of the same system in another field. It is suggested that continued study of available methods and their application is required for optimum results and for further improvement.

The author wishes to thank the executives of Humble Oil & Refining Company for granting permission to publish this paper.

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Caliper Logging in the Southwest

[*Continued from page 26*]

salt section. According to bit size and the O. D. of the casing it would require only 250 sacks to fill the annulus to a level above where the casings collapsed. The operator had donated 50 percent to the hole, making 375 sacks. According to the caliper log it required 1100 sacks to reach the desired height. This was due to the highly eroded salt section shown in the lower half of the caliper logs. The red beds are clearly shown in the upper portion of the logs and the anhydrite is clearly shown between the red beds and the salt section. The three logs placed side by side are useful for geological correlations. The salt section also shows the presence of anhydrite stringers.

Figure 6 shows a caliper log taken in a well in Winkler County, West Texas, for the purpose of determining the amount of cement to fill the annular space behind a liner which was to be cemented in the open hole. There was approximately 325 feet of open hole, part of which was making water and part was making oil. The object of the liner was to shut off all the water and oil and then an attempt was to be made by selective perforating and squeezing to find the portions which produced oil. It was very essential to determine the volumetric capacity of the space behind the liner and the caliper log was the only means for this purpose. The amount of cement was determined from the caliper log and run accordingly. The lower 250 feet of the hole had been shot with 800 quarts of nitroglycerin and it is interesting to observe the variations in diameter. As these variations were not caused by the bit which drilled the hole the enlargements and the variations were caused by the shot and by erosion while the well was producing.

Figure 7 shows a caliper log made preparatory to gravel packing a portion of the open hole behind a liner. The information provided by the log is two-fold because it shows the volumetric capacity of the hole in which the gravel is to be placed and it shows the shape of the hole.

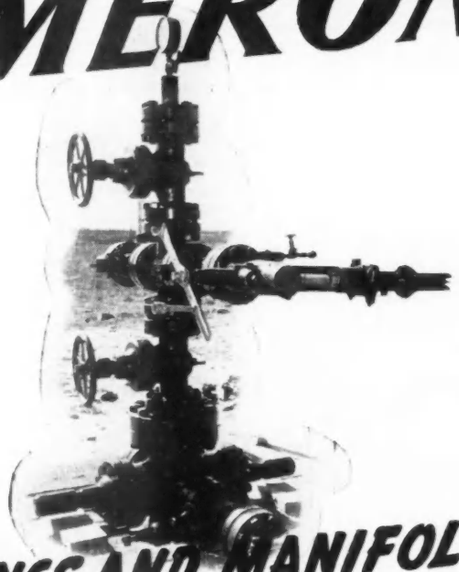
Figure 8 shows two successive caliper logs made at an interval of two weeks in a well being drilled in Lea County, New Mexico. The first log, shown by a solid line, was taken as soon as the bit reached the bottom of the salt section. The second log, shown as a dotted line, was taken when the well reached total depth, about 300 feet deeper. The purpose of the successive logs was to observe the changes in the salt section due to circulation of drilling fluid while drilling below the salt section. The first caliper log shows that as the drilling fluid picked up increased salt concentration the hole gradually tapered to bit size and the bottom 100 feet stayed at actual bit size, indicating that the circulating fluid had become saturated. The second log shows that this salt concentration was lost when the well was being drilled deeper because the salt section dissolved considerably beyond bit size while the drilling fluid was being circulated. The log also clearly shows the stratigraphic profile of the red beds, anhydrite, salt section and top of the lime.

Conclusions

For the first time there is a practical method available for measuring the variations in diameter of the open hole in a well. The logs obtained have practical application to many problems in the field. These problems are encountered in oil well cementing, formation testing, packer settings, gravel packing, etc. In addition, caliper logs will assist in studies of drill pipe failures and drilling techniques and in geological correlations.

Acknowledgment is due Myron Kinley for his early work with mechanical calipers and to a joint experimental program of Kinley and Halliburton which produced the combination of mechanical calipers and electrical recording which obtained the results described in this paper.

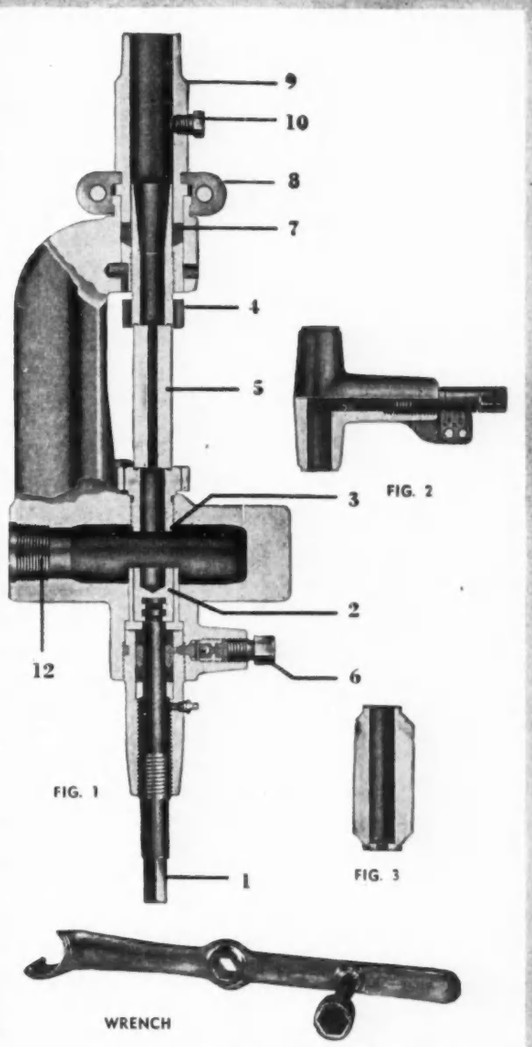
CAMERON



FLOW WINGS AND MANIFOLDS

The new Cameron Flow Wings and Flow Manifolds for Xmas tree service combine in single units the double function of conventional wing valves and quick-change positive or adjustable flow beans. The valve section of these units permits a quick and easily operated shutoff while changing chokes without the necessity of closing any vital valves on the tree. Flow beans may be changed quickly without breaking out a single threaded or flanged connection. All parts are readily replaceable in the field without removing the assembly from the well. Their compact design saves considerable steel and while these units provide several distinct operating advantages they actually cost substantially less than conventional assembled Xmas tree flow wings.

Referring to Figure 1 at right, to change flow bean fit hexagon socket in the wrench to valve stem (1) and close valve (2) against seat (3). Spanner part of wrench is then applied to clamp screw (4), and only two turns required to release flow bean (5). New bean is clamped in place by clamp screw and valve is then opened and well is back on production. Both the valve stem and valve seat are faced with hard metal to resist cutting. Valve stem and bonnet are packed with plastic packing which may be replenished under pressure. Clamp screw is packed with an asbestos ring (7) which is tightened automatically as the flow bean is clamped in place. Two-bolt union (8) obviates need for additional union in flow line. Note that the downstream end of the clamp screw is belled to reduce turbulence and cutting. Three types of flow beans are interchangeable in this unit: (1) the "proration" bean illustrated in the flow wing; (2) the adjustable flow bean illustrated in Figure 2; and (3) the "production" type bean which consists of a body and renewable stellite orifice disc. All of the flow beans clamp in position as shown in Figure 1.



1. Valve Stem; 2. Valve; 3. Valve Seat; 4. Clamp Screw; 5. Flow Bean; 6. Packing Feed Screw; 7. Clamp Screw Packing; 8. Two-bolt Union; 9. Outlet Connection; 10. Bleeder Connection; 12. Inlet Connection.

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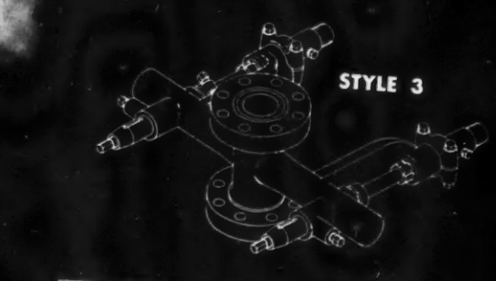
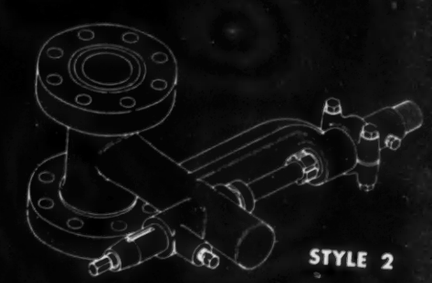
Flow Wing for installation in horizontal run of Xmas trees, as illustrated in photograph above.



Cross Type Flow Manifold for installation in vertical run of Xmas trees.

Tee Type Flow Manifold for installation in horizontal run of Xmas trees.

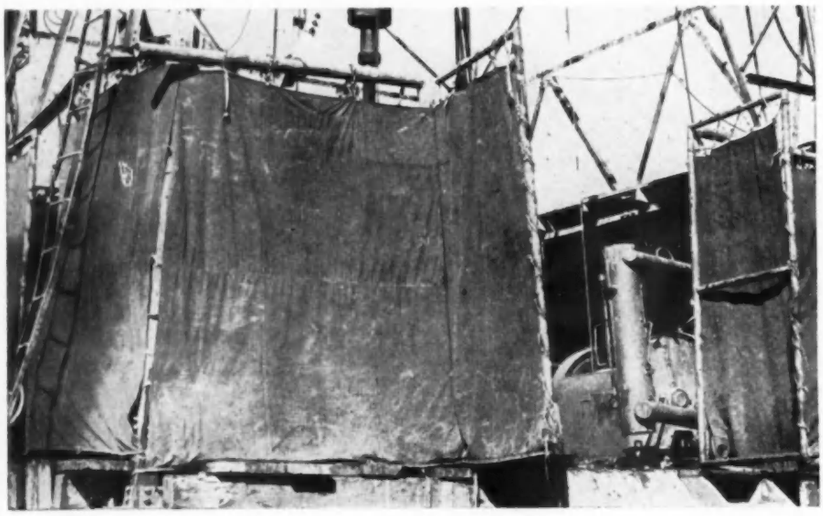


Tee Type Flow Wing for installation in vertical run of Xmas trees.

PRACTICAL OPERATING HINTS FOR

1. CREW SHELTER

Complete Enclosure Protects Drilling Floor Without Restricting Ventilation or Light



Cut to fit the various openings around working floor, these tarpaulins provide protection against wind and storm, and are easily removed when weather permits.

ONE Gulf Coast oil company protects men on its drilling rigs from cold and damp winds in the winter by erecting especially patterned tarpaulins of heavy canvas, and placing them entirely around the floor and drawworks, and also around the derrick on a level with the fourble board.

Canvas pieces are cut according to specifications issued by the company, and are provided with grommets around their borders through which ropes or wires are attached for tying to the proper girders, corner posts, or other predesignated objects which support the respective sections. Each section is numbered to correspond with its proper position on the derrick, and by simply matching the numbers, canvas sections are quickly identified for proper location, allowing quick erection when rigging up.

The canvas completely encloses the floor area, including the section behind the drawworks, and each piece, being tailor-made, is drawn tight to close all cracks and crevices, at the same time making a neat appearance. The space above the drawworks is also covered by means of a corrugated iron roofing, and the combination serves to keep out cold winds, providing greatly improved working conditions. As the derrick man is enclosed by a similar arrangement of tailor-made tarpaulins, he also is adequately protected.

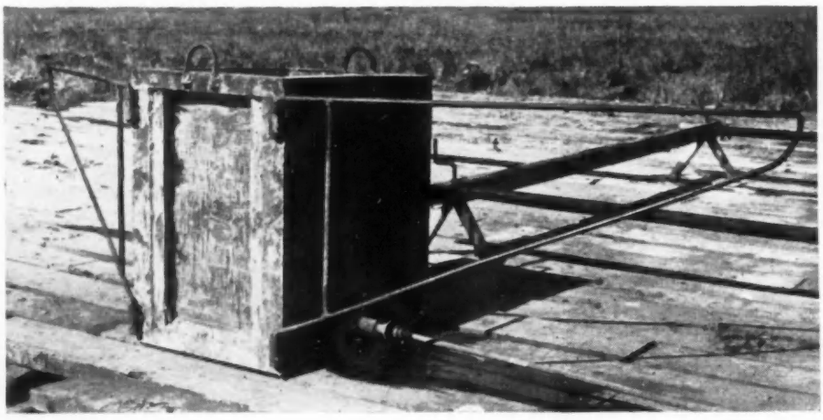
THE practical operating hints for the drilling rig and production man, appearing in these features each week, are secured from oil fields everywhere and offer suggestions that will help to improve field efficiency and safety. The items give an excellent picture of the remarkable ingenuity being exercised by the operating divisions of the industry. Contributions to these features will be paid for at the rate of $5 for each illustrated item accepted. Address contributions to "The Editor, THE OIL WEEKLY, Houston."

2. LAUNDERING

Blow Box and Drying Rack for Dungarees

SUPPLANTING the usual oil drum with its steam heating pipe as used on many rigs for washing work clothes, a neat-appearing and effective washer was built by the welder of one drilling company and fitted with necessary fittings for steam entry and drainage in the base. Handles on the angle-iron rim provide ease in moving, and also serve as retainer for pole on which articles are sometimes suspended within the washer.

Pairs of sockets, welded on the corners, support a long, braced, drying rack, formed from sucker rod, on which washed clothing may be spread for drying. The ends of the frame, bend downward, fit into the sockets, and may be removed for transportation simply by being lifted straight out. Use of the rack adds to life of clothes dried on them as compared to the usual method of hanging on scantlings close to the boilers, where wind shifts sometimes cause the articles to be burned by contact with the heated boiler shell.



Welded box with integral water connections, affords ample laundry facilities for maintaining work clothing in condition for comfort, safety and health.

THE DRILLING RIG . . .

3. BOILERS

Lever for Blow-off Saves Firing Time

Held upright by weight of operating linkage, this hook-up avoids working below boiler.

TO FACILITATE blowing down boilers, a wooden lever may be used for opening the blowoff valves. Placed in a convenient place near each boiler, the levers are erected on hinges to permit easy operation.

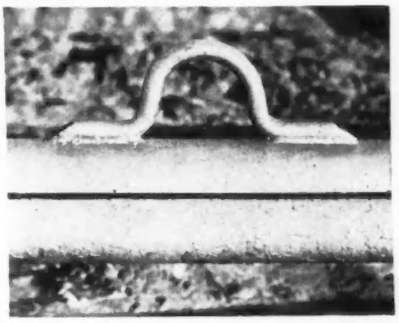
Made from a joint of 2 x 4-inch board about four feet long, each lever is shaped like an axe handle to permit a comfortable grip. To the tops of the levers are attached steel cables which extend behind the fire boxes, where they are threaded through the sheaves of snatch blocks, and thence to the blowoff valves. Each boiler is provided with an individual blowdown lever.

When the fireman grasps the handle and pulls, tension opens the blowoff valve to release steam. As the lever operates on hinges, closing action of the valve automatically pulls it back into its original position when released. These handles furnish a permanent and convenient means to operate blowoff valves, and at the same time provide a cool handle to grasp, in contrast to the usual devices which often become too hot from the boiler heat and burn the hands of the fireman or otherwise make task of blowing boilers less pleasant.

4. TRANSPORTATION

Fixed Lifting Points Speed Pipe Handling

UNITIZED water and steam lines from boilers to rig may be used with the line made in several segments joined by means of unions, and each segment, with its various pipes bound together by welded brackets, moved as a single unit. In each unit, one or more handles should be provided on one of the pipes as an aid to transporting when changing locations or to aid placing lines in position when rigging up.



Heavy steel rod, formed to loops large enough for hook or sling, is welded to steam lines.

Handles are made from rod material 12 or 14 inches long, heated and bent into the desired form. They are shaped to provide a conspicuous eye, with both ends of the rod flattened out to assume a position parallel to the direction of the pipe upon which it is placed, to provide contact on each end of the eye with the pipe for a distance of several inches.

A bead weld is made along the places of contact, firmly fastening the eyes to the pipe in the selected location. A hook is easily slipped through the eyes, or a catline attached, when moving, and the section lifted for loading on a truck or for placing in any desired position. The eyes usually are bent sharply to allow at least three or four inches clearance over the pipe, with ample space for inserting ropes or hooks.

5. DRILL PIPE

Soft Line Packers Seal Old Joints

WHEN drilling through alternating soft and hard strata, such as shale and limestone breaks, the shocks imposed upon the drill stem are sometimes severe, and tend to tighten the drill pipe joint threads excessively. If drilling under such conditions continues for longer than usual time, the joints often will be found to have tightened to such an extent that they are broken out only with considerable difficulty.

A West Texas drilling contractor helps relieve such a condition by tying a single strand of soft rope around the last thread of each tool joint, as close as possible to the shoulder. When the joint is made up in the derrick, the strand of rope will be flattened, but will supply a small but sufficient amount of cushion between the shoulders of the joint to prevent them from becoming too tight. The twine is put on the thread of each joint immediately after it is brought up on the walk preparatory to pulling into the derrick.

Wrapped around pipe threads and tied, these soft line strands compress without binding.

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CAN America produce enough oil? That's the challenge our oil industry faces today. For not only must it supply our own military and domestic needs, but it must furnish huge quantities of oil and gasoline to other countries as well.

The oil industry can feel justly proud of its foresight in developing new oil fields, of stepping up refining capacity, of laying the world's largest network of pipe lines and of building a huge fleet of tankers. But the cry for oil . . . and more oil may soon be taxing production to the limit.

How well this demand is met, is part of our job, too . . . for every drilling rig . . . every pipe line . . . every refinery and tanker needs pipe—and lots of it.

NATIONAL Tube Company is the world's largest producer of seamless pipe and tubing. When faster drilling required better, stronger drill pipe, NATIONAL made it. When the country's longest pipe lines demanded hundreds of miles of pipe, NATIONAL furnished it. When refineries needed all kinds of corrosion-resisting alloy tubing, they came to NATIONAL for their complete requirements.

Today, NATIONAL Tube Company is working at peak capacity to give you the material to produce and deliver more oil and oil products. But we are not stopping there. NATIONAL is making thousands of shells, demolition bombs, tank parts, airplane parts and numerous other essential materials to make this country strong and safe.

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UNITED STATES STEEL

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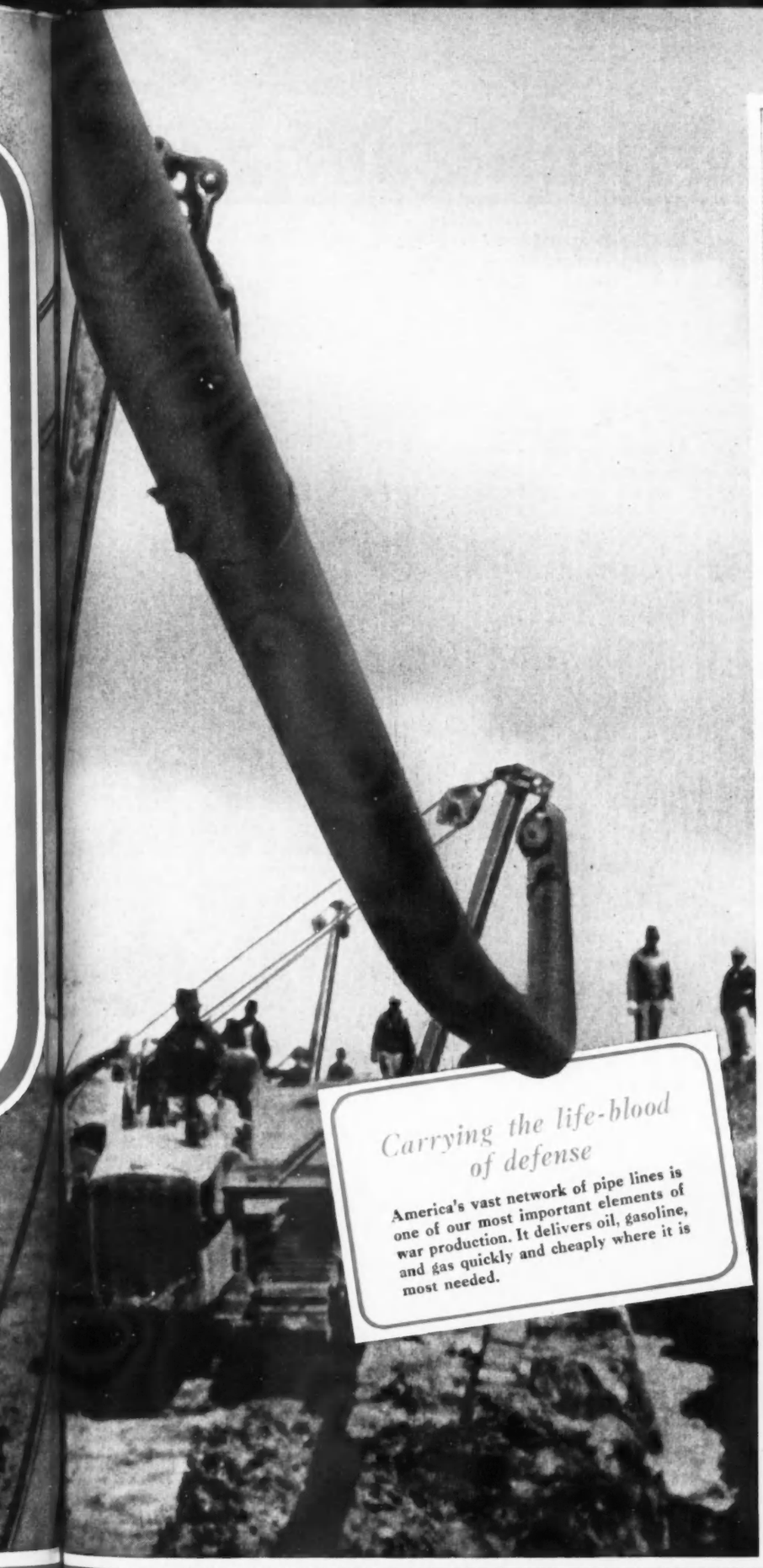
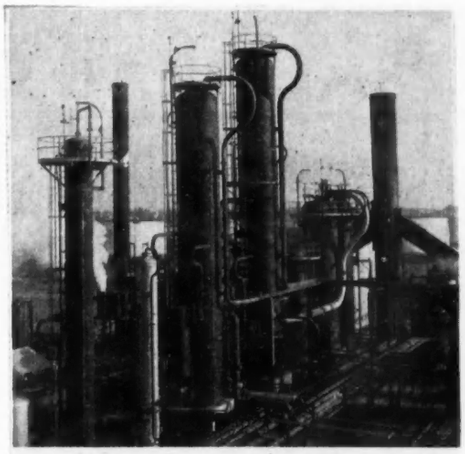


Carrying the life-blood of defense

America's vast network of pipe lines is one of our most important elements of war production. It delivers oil, gasoline, and gas quickly and cheaply where it is most needed.



This new West Coast refinery is helping to meet the tremendous demands for gasoline in war production. Pipe and tubes were furnished completely by NATIONAL.

Faster DRILLING. High-speed drilling equipment requires drill pipe that can take the tremendous strains incident to deep drilling. NATIONAL is first choice for many of the world's deepest wells.

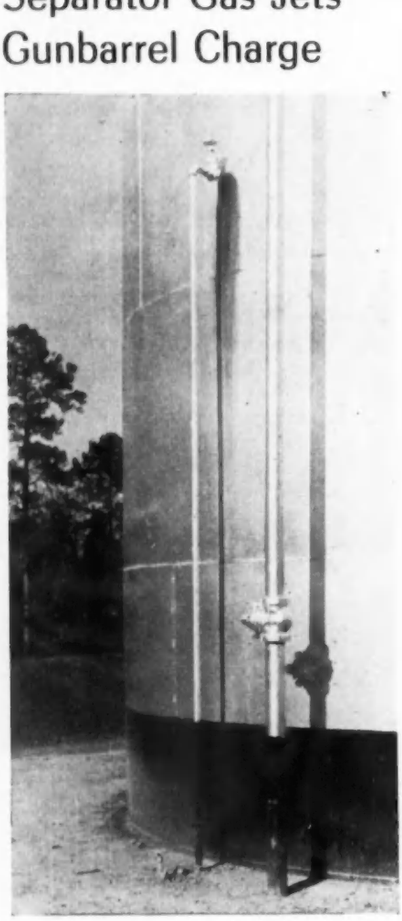
High-strength seamless casing. When you are drilling a well two or three miles down, you want only the best and strongest casing—and that means NATIONAL Seamless.

A'S STANDARD WROUGHT PIPE

PRACTICAL OPERATING HINTS FOR

1. TREATING

Separator Gas Jets Gunbarrel Charge



Churning or stirring of fluids in treating tank aided by reentry of gas.

IMPROVED mixing of fluids in a gunbarrel for treating purposes is obtained by utilizing a small quantity of gas from the separator, directed through a line into the gunbarrel. Proper admission of gas under slight pressure into the fluid inside the tank gives the fluid a rotating or churning motion and aids complete mixing of chemicals.

One operator attaches a ½-inch line from the gas outlet pipe at his separator, extending the line underground to the gunbarrel. At this point is a gate valve, the line turned vertically by using an ell, running parallel to the side of the gunbarrel to a height of approximately 12 feet. There the line, equipped with a valve, is turned into the tank, and welded to set flush with a hole cut into the tank.

When oil in the gunbarrel is being treated or heat applied, action in breaking down emulsified fluids is expedited by directing small portions of gas into the fluid body. The ensuing stirring action affords complete mixing, and heat and chemicals receive thorough distribution in the fluid. Thus, action of the chemical and heat is not only expedited, but fullest efficiency from its use is also obtained, reducing to a minimum the amount of treating, and decreasing treating expenses.

2. LEASE SAFETY

Baffle Box Controls Gas-Oil Spraying

IN ORDER to prevent oil spray from settling on field installations and roads in the vicinity of new wells, one company makes it a practice of running the end of the blow-out line into a baffle-filled wooden box located on the edge of the waste sump.

The rectangular box measures approximately four feet square by six feet long. It is sturdily constructed of 2-inch lumber, and contains several baffle partitions on the inside which break up the force and direction of flow of oil and gas.

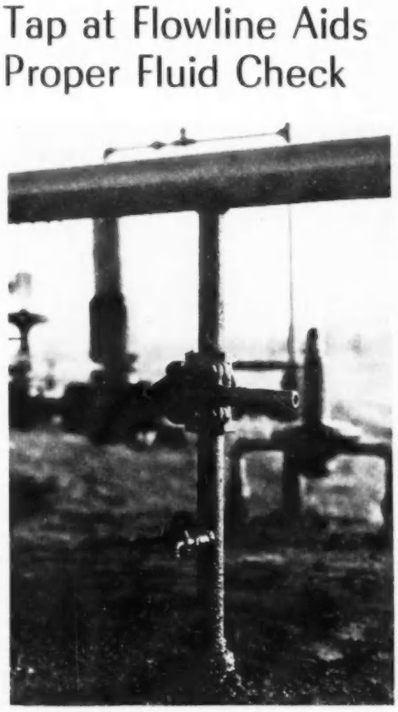
One-inch gaps left between the plank sidings, plus numerous holes drilled through the boards, provide ample places for the separated gas and fluid to escape after the flow pressure has diminished. The box is used principally on new wells still in the cleaning-up stage.

The box is skid mounted to facilitate moving it between locations.

Perforated boards distribute flow force and deliver quieted output from well.

3. SAMPLING

Tap at Flowline Aids Proper Fluid Check



Tapped into the flow line below control valve, this sampling cock saves time.

IN FIELDS where a manifold is used to regulate flow of respective wells, considerable time may be saved in obtaining shakeouts by equipping each flow line with a bleeder near the manifold. Such devices allow taking shakeouts to determine nature of flow from any well with greater expediency, without visiting each well individually. In instances where wells are in isolated or inaccessible locations, often the case in marine fields, considerable time may be saved by such installations, and overall operating efficiency enhanced.

Manifold bleeders may be made of short ½-inch nipples welded into the walls of flowline pipes before they enter the manifold. Each nipple must be provided with a valve, and it is desirable to have also an ell placed at the valve to direct flow of fluids downward as an aid to receiving it in a small container. Valves are kept closed until samples are drawn.

Fluid from a number of wells is obtained in a few moments from the several flow lines which converge at the manifold, without interrupting flow from any of the

THE PRODUCTION MAN...

producing wells. Thus, nature of flow from all wells is easily checked, and by eliminating need for pumper to visit the wells individually, efficient operation is attained.

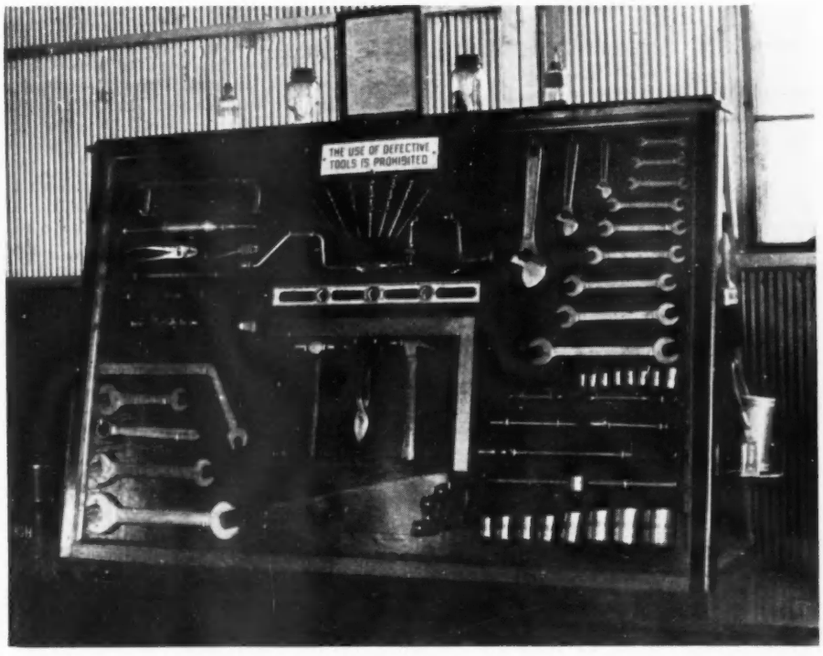
4. TOOL CARE

Display Rack Speeds Equipment Selection

fies selection of a particular unit, and reduces time usually lost in trying to fit one of a number of wrenches to an off-size bolt or nut.

Of questionable merit is the placing of the saw with the teeth upward, which, while while serving to protect the teeth against being damaged by supporting pins, exposes them to possible injury by tools striking them if misplaced or dropped during racking. Wooden brackets, faced with a small strip of braided hemp packing, will support the saw on its teeth without injury and without affording a possible means of hand injury through accidental contact with the cutting edge.

Outlining of tools with white paint identifies missing equipment and speeds return.



Inclined at slight angle to retain tools on their supporting pegs, this display board enables quick check of equipment and speeds repair work.

TOOLS, being one of the most important parts of upkeep equipment at pressure maintenance plants and electrical generation units, should be given fitting attention. Instead of being hidden in drawers beneath the working surface of a bench, tools can be selected instantly if they are placed on a serviceable and attractive board at the most convenient point near the machines requiring adjustment and maintenance. The design of the board with supporting devices provides a place for every tool required, and a vacant space shows immediately whether the tool is in use, or if someone has neglected to return it after being used.

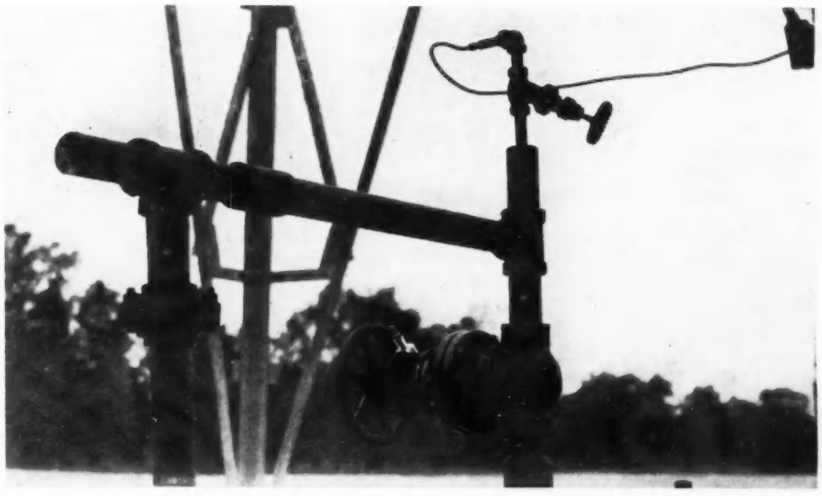
Grouping of tools on the board in sizes and classifications simpli-

5. CHEMICAL FEED

Pre-choke Injection Reduces Emulsion

MANY operators inject treating chemicals into the flow stream ahead of the choke to increase mixing efficiency of the treatment and lessen emulsion. One Gulf Coast producing company inserts a bull plug on the Christmas tree, the top of which is equipped with a drilled and threaded outlet for connecting a ½-inch nipple four inches long. A valve is placed on this nipple, then another short nipple is added and connection made with the small tube which leads to the chemical injector pump. The regular choke is placed one or two feet farther downstream.

Action of the injector pumps chemicals into the flow stream ahead of the choke, giving the fluids ample time to mix prior to and during passage through the choke. Improved mixing which results reduces emulsion and effects considerable time and expense in treating.



Tapped into well-head hook-up above main control valve, this feed insures thorough mixing in flow and reduces tendency to emulsify at choke.

Scrap Week Goes Over Strong

Large Quantities of "Forgotten" Steel Collected at Centers

By ELTON STERRETT
Equipment Editor

END of the first week of Texas' oil industry scrap drive closed with vast quantities of hitherto lost, "forgotten" or conveniently mislaid material being collected, moved to designated centers, and there weighed and made available to scrap dealers or brokers for movement to the steel mills for reconversion into useful materials.

Figures on tonnage actually rounded up during this first week of effort will not be available until reports from district chairmen and weighing centers are all collected, and it is expected that a greater volume of scrap will be loaded and hauled from the oil-producing counties of the state during the first week in March than during the initial week of the drive. Due to inability of anyone connected with the work to forecast the number and loading points of the cars needed to transport the scrap, it was in many cases impossible for the railroads to supply cars as the piles became available for shipment.

Much of the material collected is in size and shape where relatively little time and energy must be expected to put it into form usable by the steel mills. Other scrap required cutting, torching, or disassembly, and this material, where insufficient quantity, will follow that more quickly available by reason of size and sorting.

Direct to Foundries

In addition to many cars of steel scrap sorted and shipped to steel mills, much of the scrap iron collected went directly to foundries within the state and thus became more quickly available for war or industrial need through re-use without the delay which would have necessarily been borne for shipment of unclassified scrap to the northern and eastern mills.

While responsibility of the oil industry ends once a certain lot of scrap is collected, weighed and bought by a scrap dealer, men in the oil industry may frequently, through commercial relations with scrap dealers and railroads, greatly accelerate the handling of the material in case there seems to be a tendency to let it lie in storage yards for possible price increase or any other reason.

By making this initial roundup of scrap the oil industry has set in motion toward the mills vast quantities of vitally needed raw materials. This impetus, once given, must be followed up by regular, routing scrap collections, and by urging and, if necessary, bringing pressure to bear to insure prompt forwarding of such scrap to the mills.

PRAISE for the "very fine cooperation" of The Oil Weekly in the Texas Mid-Continent Oil and Gas Association's scrap collection campaign was expressed Saturday by Charles F. Roeser of Fort Worth, general chairman of the program.

"We are indebted to Ray Dudley, publisher of The Oil Weekly, for the suggestion that we take over the scrap collection campaign in the Texas industry," Roeser said.

"We also are greatly indebted to him and his editors for their very fine cooperation before and during scrap-collection week, in the editorial pages. The Oil Weekly has been an extremely effective medium in reaching our industry, and as we enlarge our campaign to make it a permanent program of scrap collection we feel sure we may count upon continued support."

WHERE DO WE STAND?

JAPAN had five years' scrap supply on hand last December 7. Since that date armies of the Rising Sun have acquired by capture and demolition an estimated five to ten times the steel lost, expended, exploded and sunk by Allied effort. And, following Axis precept, this captured iron and steel will lose no time being converted to war needs.

The United State has at the mills scrap for *five days operations.* Scrap coming in must keep this meagre stock pile going, or vital furnaces are shut down, production lost. Ordinarily, the automobile industry furnished some 3½ million tons of steel and iron scrap per year from wrecked and junked cars alone. Now, with new production cut off, much of this backlog will be kept in service, made to eke out more years of indifferent operation.

Scrap to replace this civilian reclaim and the vast volumes of industrial scrap normally flowing from the automobile plants as they turned out more than 4 million cars a year must be found somewhere. If it is necessary, all idle materials must be conscripted to fill this need and buried pipe lines, abandoned street car tracks, and other stores of potential steel scrap exploited, even though labor costs alone of such reclamation exceed the dollar value of such scrap when sold.

To stay in the scrap, scrape up and *get in the scrap.*

• • • Pipe and sucker-rod protectors are apt to turn up in miscellaneous scrap unless care is taken to hold them out. If sold as unclassified scrap—as they must be if damaged past re-use—they bring only the standard price for open-hearth charging scrap, whereas if strung on bits of soft rope or wire, they may be sold to the same scrap-metal buyer on a piece basis for eventual shipment to the type of manufacturer using them initially.

Scrap Program Expanded And Made Permanent

The Texas petroleum industry's scrap-collection campaign was expanded Saturday by Charles F. Roeser of Fort Worth, general chairman, into a continuing program for the industry. The campaign was undertaken by the Texas Mid-Continent Oil & Gas Association at federal request.

"The results of our scrap-collection week have been so gratifying that I am today asking Texas oil and gas operators to keep on collecting and moving their scrap for the duration of the emergency," Roeser said. "With the organization which we now have set up, the operators can continue their collection of scrap as it accumulates and move it out through channels with which they are now familiar.

"Collection week is only the kick-off in our campaign. We are in the game until it is won. In fact, next week should see even more scrap trucked in and loaded out for shipment than the past week brought in."

Although few county chairmen and co-chairmen have reported the amount collected in the first week's drive, incomplete figures indicate very encouraging results, Roeser said.

"The reports we have so far received show that already hundreds of tons of iron and steel, and sizeable amounts of other metals and of rubber, have been piled up in the collection centers," he said. "Some of this has already been loaded into freight cars and is now on its way to eastern mills to help relieve the steel shortage. Much of the cast iron is being moved to Texas foundries which need it and can use it more cheaply and quickly."

Many of the operators surprised themselves at the amount of scrap they found, the chairman commented. One small operator piled up 10 tons, and another 20. A larger operator found 40 tons on his leases. These had never collected their scrap before. However, some of the larger companies which have been selling their scrap for some time made a re-check of properties and scrapped additional material.

The first carload of scrap was moved from Corpus Christi the day before the campaign officially opened. Since then dozens of cars have been loaded in various parts of the state.

"The petroleum industry is to be congratulated upon the wholehearted cooperation which its members are giving in this program," Roeser said. "In fact, our industry's campaign has attracted the attention of national salvage officials and may serve as a pattern for similar drives by other industries to collect their own scrap."

SCRAP 'N SALVAGE

The other fellow can't do it all—oil-field scrap must be collected wherever it exists, and no quantity is too small to be overlooked.

Boys "mining" gullies in East Texas in which old auto bodies and frames were used as stops to promote settlement of stream-borne debris, uncovered a cache of nearly a thousand dollars' worth of three- and four-inch valves which were part of an initial shipment to one of the hot-oil refineries established in the big field in the early '30s. Not all scrap reclamation efforts promise returns of like magnitude, but just the auto bodies and old pipe recovered from the gullies more than paid profit over the labor expenses.

"Mining" of the waste pit at one refinery with a drag-line shovel as preliminary for enlarging the disposal system brought to light pipe, valves, return bends and other damaged materials which were more easily thrown away than reclaimed. Poundage recovered, after cleaning to remove mud accretions, totalled slightly over two long tons.

Junk dealers are regarded by many in the oil industry as in a class with "hoss" traders and gypsy fortune-tellers. But the sharp practices are not all on the one side. Discarded pumps, bought at so much per pound, when hauled to the yard for dismantling, have been found filled with freshly wet sand, with short ends of welding rods, and even, on one occasion, with what was evidently the leftover end of a batch of concrete. Sections of pipe, each end crooked enough to prevent sighting through, and cleaned at the ends, are likewise unaccountably filled with sand, mud, or tightly caked B.S. All of which makes it imperative that the oil company deal with a recognized scrap metal buyer, and that the company use reasonable care to insure the scrap offered being what it purports to be, if fair business dealings are to be observed, and if industry and scrap dealers are to cooperate most effectively in moving the scrap from the oil field to the steel mill with a minimum of friction and delay.

Hitch-hiking from well to well in the bottoms of "spares" boxes such as this are thousands of pounds of useless scrap iron and steel—adding to the cost of handling and contributing nothing to the job. A cleanout of such boxes and appraisal of the contents by a disinterested checker would result in releasing much badly needed scrap for steel making and lighten the load on the move to the next location.

Congress

[*Continued from page 13*]

transportation is concerned, the industry today is "the victim of its own past efficiency."

Because it operated an efficient, low-cost transportation system, he explained, there was little or no slack to absorb the shocks of war; consequently, today, the East Coast and the Pacific Coast are seriously short of needed products.

Emphasizing that the obtaining of oil of the type and quantities needed for war is not "just a matter of opening wide a number of spigots," he asserted that "the job of assuring at all times an adequate, continuous supply of crude oil, natural gas and associated materials for all military and essential industrial and civilian requirements is a prodigious task, requiring the unremitting attention of both government and industry."

"The first requirement for war is the development and continuous maintenance of sufficient known reserves of crude oil and natural gas and sufficient productive capacity to meet all necessary needs," Davies explained. "This requirement is basic, for crude oil and gas reserves constitute the foundation of the entire petroleum industry. It becomes even more urgent with military reverses that have already lost to the United Nations some of our Far Eastern supplies and may, conceivably, lose still other sources outside the Western Hemisphere.

Must Be Increased Exploration

"Sustained production of petroleum depends entirely upon active discovery operations and proper development programs. There must be increased exploratory activity if we are to make available new reserves of oil and gas at a rate at least equal to that at which known or previously discovered reserves are produced and consumed.

"The recent discovery record has not been too good. Over the last three years, for example, new discoveries of crude oil, not considering revisions and extensions to known fields, have failed to balance consumption by approximately two billion barrels. Furthermore, analysis shows that a substantial portion of both current reserves and production are associated with fields that are more than 50 percent depleted. Moreover, the reserves of gas have been seriously reduced in important sections of the country, and demand is now seriously pressing supply."

Davies admitted the Conservation Order M-68 has been the subject of widespread discussion and some criticism in the industry. "It was hardly to be expected that a measure as restrictive of customary operations in the industry would be received with complete approbation," he told the subcommittee. "It is now evident, however, that there is rather wide appreciation of the basic soundness of the order, in which we have attempted to minimize the expenditure of critical materials while assuring the means of meeting the requirements of the war effort.

"On the basis of the restricted development permitted under M-68, we estimate that the drilling

SEE PAGE 14

program for 1942 will be reduced at least 40 percent below the 1941 level. At best, it seems unlikely that materials will be available to drill in excess of about 19,000 wells, but it is our confident hope that this figure will include a substantial increase in the number of exploratory wells.

"For the government's part," he stressed, "we stand ready to give, and are giving, the production branch every assistance within our power to give. Not only are we seeing to it that the operators get the tools with which to do the job, but we have taken an important, far-reaching step forward by our practice, begun in January, of issuing recommended monthly production rates.

"The sole object of that practice is to accomplish gradually a better balanced participation by each oil-producing state in supplying the national demand for crude oil. We have acted, we believe, in the national interest by providing a means whereby the Nation may be assured an adequate, continuous supply of petroleum of the types required to manufacture aviation gasoline, snythetic rubber and other products not only for the first year of the war but for each ensuing year as well."

Refinery Expansion

No. 1 problem in the refining branch, he said, has been to secure more and more 100-octane aviation gasoline. This is being accomplished through plant expansion and new construction, assistance to refiners in negotiating contracts with government agencies for both financial assistance and sales, and direction of refining along lines designed to produce more of the essential war products.

In the field of transportation, OPC and the industry are attempting to make up for the loss of civilian tanker tonnage by greater use of railroad cars and other expedients, he continued. Marketing, because of war conditions, has become the "stepchild" of the industry, he said.

"We realize that we are asking and must continue to ask the petroleum industry to do many things which will upset its peacetime economics and price structure," Davies commented. "As the many adjustments required fully to apply the resources of petroleum to the war effort are made, there will be need for price changes in various products at various places, in order properly to recognize in these terms the operating facts and preserve the solvency of the industry.

Study Price and Increased Costs

"As war conditions require special production practices, changes in refinery balances, the movement of products by different transportation methods, or other, perhaps radical, deviations from what is normal in the business, price adjustments must follow," he insisted.

That problem is under study in OPC, he said, and the matter also has been taken up with Price Administrator Leon Henderson.

Davies and members of his staff were questioned at length by the subcommittee, Representative Holmes of Massachusetts leading off with an inquiry whether Ickes has done anything toward reviving the Texas-New York pipe-line project. That matter has already been taken up with the War Production Board, Davies said.

Questions as to the effects of priority restrictions on exploratory work were asked by Representative Kelly of Illinois, and later Congressman Sanders of Louisiana, not a member of the subcommittee, took up the same question from the standpoint of price.

The deputy coordinator admitted that there are restrictions on the use of materials, but asserted there

is no escape from those restrictions in the light of the shortages that exist. Price also is an important factor, he said, but would not concede that it was the only one influencing exploration.

"We art trying," he explained, "to have WPB allot to us a good amount of steel and other materials for the year and let us so divide that up for industry operations that it will best serve the war purpose.

Depletion Allowance

Kelly also asked what effect a reduction of the depletion allowance would have on exploration, and Davies asked that a reply be given by J. Howard Marshall, chief counsel, who said OPC has not reached any final conclusion but that "anything that tends to diminish the cash resources of the companies that are actually carrying on exploration work tends to retard exploration by just that much."

Marshall told Chairman Lea, in answer to a question, that the coordinator's office is not yet prepared to make recommendations for legislation to amend the antitrust laws to legalize the "clearances" now given by the Department of Justice to programs involving concerted action by the industry.

He contended, however, that those clearances absolved the companies from prosecution for violations, and maintained that the same protection extends to triple-damage suits which might be brought by persons affected by programs developed by federal agencies and carried out under their direction.

Answering other questions from the chairman, Davies said the East Coast stock position is steadily growing worse and inventories now are 7,500,000 barrels under those of a year ago.

Lea introduced a new factor into the picture when he asked Davies how cooperative other government agencies are proving. The deputy administrator admitted that the situation is none too satisfactory, and disclosed that on February 23 a meeting was held at which a council of representatives from the approximately 28 agencies interested in oil was formed, to meet every two weeks in an effort to iron out duplication and friction.

"The way of the coordinator is not easy in Washington," he said. "I cannot speak with the same enthusiasm of cooperation in Washington as I do of the cooperation of industry. It is true that the President, in establishing the oil coordinator asked that those departments give the coordinator antecedent advice as to anything they may do in relation to oil, but memory is short and constantly departments forget to give antecedent advice. Cooperation leaves a great deal to be desired."

Discovery Rate Seriously Low

Robert E. Allen, assistant deputy coordinator, explained for Lea the principles underlying the production recommendations issued by Ickes, stressing the need for planning output now so as to be sure of oil no matter how long the war lasts. There will be no shortage of oil for military needs, he promised, but there might be a shortage of oil for essential civilian needs if "prudent planning" was not adopted.

Allen pointed out that the situation with respect to discoveries is serious, and explained that on the basis of current consumption of approximately 1,500,000,000 barrels annually (possibly later to be cut to 1,250,000,000 barrels because of shortage conditions and curtailments of civilian consumption) new discoveries of 75,000,000 to 80,000,000 barrels are required every three weeks to maintain reserves. The major difficulty, he said, is that there is a relative shortage of locations on which to explore, but high income taxes also play a part in limiting exploratory work.

At the conclusion of Davies' testimony, Representative Wolverton of New Jersey voiced warm commendation of the way in which Ickes and Davies have taken advantage of the brains of the industry, declaring that there is probably no other government agency so thoroughly manned with men of practical experience in the industry they are dealing with.

Jones Talks About Rubber

At the afternoon session, Federal Loan Administrator Jesse H. Jones disclosed that within three weeks contracts will be let for the construction of the last of a series of plants which by the end of next year will be producing synthetic rubber at the rate of more than 500,000 tons a year, sufficient, he said, to meet "the actual demands of our war program, with something for necessary civilian uses."

The present program will require from 25 to 30 plants for the production of the raw materials and four to six plants for the manufacture of rubber, he said.

The proposed production, together with stockpile rubber, the latter used as sparingly as possible, will carry the country through until it can be determined whether we can look to any resumption of natural rubber supply, but, he pointed out, the 500,000 tons now contemplated is not necessarily the limit to which snythetic production can be carried.

Jones declared that the oil and rubber industries have been extremely cooperative in working out the government program.

Government and industry are agreed on the undesirability of any rationing of gasoline, it was declared by Dr. Robert E. Wilson, president of Pan American Petroleum & Transport Company and formerly petroleum consultant to OPM. Also undesirable are gasolineless Sundays, although a curfew on filling stations and Sunday closing would be helpful, he said.

Wilson particularly stressed the financial losses which are being taken by the companies in transportation. Last fall's use of tank cars cost the industry about $5,000,000, which was not compensated for in any way until OPA granted a 3/10-cent-per-gallon increase in gasoline prices late in January.

Since then, however, the use of tank cars has been increasing steadily and will probably reach 300,000 barrels a day within the week, and the increased cost of transportation is more than the amount of the increase and the industry is losing about $1,000,000 a week on transport costs.

Still more difficult, he continued, is the heavy fuel oil situation, where even tanker transportation cost results in a loss. Tanker expenses, he explained, have increased tremendously, war risk insurance rates have risen to $1.75 per $100 of value which, in the

case of new, high-cost vessels, constitutes a heavy burden, in some cases amounting to as much as 18 to 20 cents per barrel of oil transported.

Another difficulty facing the industry is the loss of technical men to the military services.

"The general outlook for the industry is beset by many uncertainties," Wilson said. "Crude production, held back by wise conservation measures, can still be increased substantially in case of need, but the rate of discovering new reserves has slowed down seriously during the last few years, and extensive wildcatting as well as reasonable drilling programs for proven areas are both necessary to maintain our ability to produce oil as needed. It is certainly a poor time to reduce incentives to making new discoveries as the proposed changes in depletion allowances would do.

"Most of our excess refining capacity was put to work last fall, but the shortage of rubber, plus the local transportation shortages will probably reduce consumption enough to offset growing export and military needs, barring the possible actual destruction of some major refinery centers such as those at Aruba or Curacao. Many shifts in demand are bound to take place, probably mainly in the direction of requiring less motor fuel and more light and heavy fuel oil, together with greatly increased amounts of special products such as 100-octane gasoline, toluene and the constituents of synthetic rubber.

William R. Boyd, Jr., chairman of the industry war council, also appeared before the subcommittee, devoting himself to an exposition of the steps taken by the coordinator in developing industry participation in the work of his office, and stressing the friendly relations which have been built up between the government and industry as a result of the straightforward manner in which OPC has conducted its operations.

Further hearings were postponed until Representative William P. Cole, Jr., chairman of the subcommittee, now ill, returns to the Capitol.

Title 32—National Defense Chapter XIII—Office Petroleum Coordinator for National Defense

(Recommendation No. 32)

PART 1503—PRODUCTION

To the State regulatory agencies having jurisdiction over the exploration, development, production, or conservation of petroleum, to the respective Production Committees of the several Districts, to all producers of crude petroleum or natural gas and to all producers of liquid and gaseous hydro-carbons from condensate pools:

In order to facilitate the administration of paragraphs (c) (7) and (c) (8) of Section 1047.1 (Conservation Order M-68, as amended), the War Production Board has issued Amendment No. 3 of Conservation Order M-68, as amended, which defines the term "uniform well-spacing pattern." Such amendment, as well as the provisos included within such paragraphs, provides that separate property interests, within the borders of drilling units of the prescribed size must be first consolidated before wells can be drilled thereon.

In order to avoid the creation of tracts within fields whose owners do not have the opportunity to participate in production, it is necessary that such tracts be consolidated with the adjoining tracts or drilling units within which they would most logically fall, irrespective of whether such consolidations occur prior or subsequent to the formation of such adjoining tracts into drilling units upon which wells are or are to be located. If a portion of the owners in a field fail or refuse to afford the remainder of such owners a reasonable opportunity to participate in the development thereof or the production derived therefrom, those who have been so deprived may apply for exceptions to those Orders which prohibit the use of material to drill wells except in specified instances, by reason of their own willingness to enter into reasonable consolidation agreements and the failure or refusal of the adjoining owners to undertake such consolidations.

To assure the development of the respective fields pursuant to uniform well-spacing patterns and, at the same time, to assure that the drilling units therein be so constructed as to afford all owners a reasonable opportunity to participate in development and production, it is necessary that the formation of drilling units be accomplished in such manner as will effectuate such policy.

THEREFORE, pursuant to the President's letter of May 28, 1941, establishing the Office of Petroleum Coordinator for National Defense, I do hereby recommend that immediately and until further notice:

Sec. 1503.25 *Formation of Drilling Units.* All persons, natural or artificial, engaged in the exploration for, or development or production of petroleum, shall, in the construction or formation of drilling units pursuant to paragraphs (c) (7) and (c) (8) of Conservation Order M-68, as amended, upon which wells have been or are to be drilled, so construct or form such units as to afford all owners within each field a reasonable opportunity to participate in the development thereof and production derived therefrom. Whenever such participation can only be accomplished by consolidating all or parts of two or more adjoining tracts into a drilling unit or drilling units, such tracts or portions thereof as would not otherwise participate in the development of or production from a field shall be consolidated with the adjoining tracts or drilling units within which they would most logically fall.

Sec. 1503.26. Whenever a portion of the owners in a field refuse or fail to afford the remainder of such owners a reasonable opportunity to participate in the development thereof or the production derived therefrom, irrespective of whether such participation would be accomplished by consolidations occurring prior or subsequent to the formation of drilling units within adjoining tracts, those who have been so deprived should file, with the Petroleum Coordinator for National Defense, applications for consideration by the Division of Industry Operations of the War Production Board, requesting exceptions to those Orders which prohibit the use of material except in specified instances, setting forth, in addition to the information required by the appropriate Form, not only their willingness to enter into reasonable consolidation agreements but the circumstances surrounding the refusal of the adjoining owners to undertake such consolidations.

(Signed) R. K. DAVIES,
Deputy Petroleum Coordinator for National Defense.
February 24, 1942.

• WPB •

Steel Embargo

The War Production Board on February 23 imposed an embargo on the delivery of casing and line pipe except on orders bearing a preference rating of A-9 or higher.

The prohibition on the shipment of line pipe will go into effect March 7; that on deliveries of oil country casing, tubing or drill pipe on March 14.

Warehouses which purchase this type of goods are entitled to use a preference rating of A-9 under outstanding orders, and oil companies may use an A-8 rating under Preference Rating Order P-98.

"The purpose of the order is to prevent shipments of steel for use in the petroleum industry on unrated orders, and thus to make sure that the limitations applying to the industry are observed, including limitations on inventories," it was explained.

The Week's News

OPC Recommends Lower Production Rate in March

Steadily increasing stocks of crude and refined oils at Gulf Coast points were reflected in OPC recommendations for production in March, calling for 3,996,800 barrels a day, or 105,000 barrels under the February allocation, although 417,400 barrels a day more than actual production in March, 1941.

But the situation, as seen by the Bureau of Mines, does not warrant the current low rate of crude runs, apparently developing in anticipation of reduced gasoline demand resulting from curbs on the sale of automobiles and tires and the possibility of rationing.

In fact, the bureau suggested, increasing war and export requirements probably will be found at least to balance any curtailment in civilian consumption of all oils in 1942, with requirements in the first half of the year materially higher than those in the corresponding period of 1941.

Announcing the month's quotas for the several states, Ickes pointed out that demand in Eastern consuming centers continues heavy and explained that the reduction from February "reflects particularly the fact that stocks of crude oil and refined products have been piling up on the Gulf Coast, because of transportation difficulties."

"Accordingly," he said, "the recommended rate for Texas crude production is 85,400 barrels daily lower than that for February, and decreases appear also in the rates for Louisiana, Arkansas and New Mexico, a large portion of whose production moves to the Gulf. Pacific Coast transportation difficulties likewise are reflected in a slight reduction in the recommended rate of production for California."

On the other hand, a 10,000-barrel increase for Oklahoma, he said, "reflects a recent steady decline in stocks of crude of Oklahoma origin, most of which move to Midwestern and Eastern centers of demand by pipe line and tank car.

"Minor adjustments in the recommended rates for other producing states are intended to bring the production more in line with a sustained and more efficient basis of operation," he added.

Crude Stock Increase

In its monthly forecast of demand, released February 25, the Bureau of Mines pointed out that crude stocks increased at an average of 241,000 barrels daily during the 4 weeks ended January 31, while average crude production in that period was 4,114,000 barrels and runs to stills 3,837,000 barrels a day, indicating a demand for domestic crude of 3,873,000 barrels. Actual production was at a rate of 24,400 barrels a day under the initial recommendation issued by Ickes.

"The total demand for all oils in December, 1941, showed a gain of almost 17 percent over December, 1940, and partial data available for January, 1942, indicate an estimated gain of about 14 percent over January, 1941," the bureau explained. "These figures indicate a rate of total demand considerably higher than was anticipated. The sharp drop in the demand for crude petroleum in January, consequently, was not due to a decline in the total demand for all oils but to a reduction in refinery runs, with

[*Continued on page 57*]

Recommended Production

The OPC recommendations, barrels per day, to the various states for March output, compared with the recommendations for February and actual production in March, 1941, were as follows:

	March	February	March 1941
Texas	1,510,600	1,596,000	1,262,500
California	627,000	632,300	598,300
Oklahoma	405,300	395,300	432,400
Illinois	362,500	371,800	330,200
Louisiana	330,000	335,000	295,800
Kansas	245,800	251,700	203,800
New Mexico	114,500	119,300	111,800
Wyoming	80,500	78,000	82,700
Arkansas	71,500	74,500	80,000
Mississippi	55,600	57,400	14,200
Michigan	49,500	47,000	38,100
Pennsylvania	48,200	48,000	44,800
Montana	21,000	20,400	17,500
Indiana	18,000	17,200	19,000
New York	14,500	14,700	14,000
Kentucky	12,000	12,500	10,600
West Virginia	9,600	10,000	9,700
Ohio	9,200	9,000	7,200
Colorado	6,400	6,500	3,600
Nebraska	5,100	5,200	3,000
Other	.....	.....	200
Total	3,996,800	4,101,800	3,579,400

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OIL IS AMMUNITION ★ KEEP 'EM PRODUCING

Compact Commission Will Compile Reserve Estimate

The Interstate Oil Compact Commission will make its own survey of the nation's crude oil reserves, and will suggest a production rate for the various states. The commission's executive committee in session last week at Oklahoma City voted to make the survey which was requested by Robert E. Allen, director of production for the Office of Petroleum Coordinator.

At the same time, the compact adopted a motion urging all oil-producing states to use uniform methods in arriving at reserve estimates. At present there is no set method of arriving at these figures. The compact committee also voted to call on the oil industry for 15 engineers to volunteer assistance in making the report. The committee decided to make the findings of its research and coordinating committees available to all oil states.

Chairman Leon C. Phillips revealed that Allen had asked estimates on the number of fields that can produce for the next five years, and what percentage of oil would be produced by stripper wells. Phillips also announced that a bill had been introduced in the Kentucky legislature permitting that state's entrance into the compact.

Attending the committee meeting were Governor Phillips of Oklahoma, chairman; Andrew F. Schoeppel, chairman of the Kansas Corporation Commission; Hiram M. Dow of New Mexico; J. C. Hunter of Texas; Robert J. Short, member of the Arkansas Oil and Gas Commission; Charles Orr, secretary, and Ted Knopp, assistant secretary. The next meeting will be held in Little Rock, Arkansas, May 27-28.

Two States Will Exceed Recommended Production

Crude oil production is due to conform closely with recommendations of the OPC during March, as allowables have been fixed in such conformity in 7 of the 8 prorated states, while another important producing state, Illinois, although not prorated, actually has been producing only about the same amount as that recommended for March. The prorated state that disregarded the OPC allocations was Louisiana, which set an allowable 16,031 barrels daily above its quota. Also due to produce more than recommended by the OPC is Mississippi, which never has adopted proration and which currently is producing around 85,000 barrels daily, although OPC recommended output of only 55,600 daily in March.

Shown in detail in an accompanying table, which embodies also the OPC recommendations, the state allowables for March reflect curtailment of demand for crude from Arkansas, Kansas, Louisiana, New Mexico, and Texas, because of the war's interference with coastwise shipments to the East Coast. Oklahoma gained a larger allocation than in February, because of withdrawals from storage. California's quota was somewhat reduced.

Oklahoma's allowable for March is up 10,000 barrels from that in February, in

Crude Production to Conform Closely With OPC Recommendations Under March Allowables

(Barrels Daily)

STATE	Recommendation of Petroleum Coordinator for February	Recommendation of Petroleum Coordinator for March	State Allowable Beginning of March	Difference March Allowable From Recommendation	Percent Difference March Allowable From Recommendation
Arkansas	74,500	71,500	71,500	.....	.....
California	632,300	627,000	‡627,000	.....	.....
Kansas	251,700	245,800	245,800	.....	.....
Louisiana	335,000	330,000	346,031	+16,031	+ 4.8
Michigan	47,000	49,500	49,500	.....	.....
New Mexico	119,300	114,500	114,500	.....	.....
Oklahoma	395,300	405,300	405,300	.....	.....
Texas	1,596,000	1,510,600	*1,476,155	—34,445	— 2.3
Total 8 Prorated States	3,451,100	3,354,200	3,335,786	—18,414	— 0.5
Illinois	371,800	362,500	†357,550	— 4,950	— 1.4
Mississippi	57,400	55,600	†85,500	+ 29,900	+ 53.7
Other States	221,500	224,500	.....	.....	.....
Total United States	4,101,800	3,996,800	.....	.....	.....

* Calculated daily average of actual production at beginning of month, allowing for underproduction of 3½ percent below net allowable, which was figured at 1,536,061 barrels daily as of March 1. However, allowable normally increases as new wells are completed, and consequently, actual daily average production for month may be expected to be slightly greater than average as calculated for March 1. Under March order, most Texas fields were ordered shut down March 1, 7, 8, 14, 15, 21, 22, 30 and 31.

† State not prorated; figure shown here represents actual daily average production in four weeks ended February 21.

‡ OPC allocation also represents allowable production, state quota being distributed among fields by Conservation Committee of California Oil Producers, under OPC supervision.

accordance with OPC allocations, and consequently, proration restrictions have been lifted again in 30 fields that were put back on proration under the state's quota for February, after having been exempted from restrictions originally on January 1, 1941.

The Texas Railroad Commission's proration order for March places the state's net allowable at 1,536,061 barrels daily. The new allowance is slightly in excess of the OPC recommendation of 1,510,600 barrels; however, Texas producers normally produce about 3.9 percent less than the allowable assigned, and it is expected that on this basis, they will produce 59,906 barrels less than the net allowable. When this is considered, it appears that the actual production will be approximately 34,445 barrels less than the estimate of the OPC.

There were no field cuts provided in the order, save those in the nature of an adjustment based on new wells added and reductions made because some fields did not make allowables assigned previously.

The number of shutdown days was fixed at nine, two more than were provided in February; however, since there are three more days in the month of March, the net result is one more producing day.

The cut of 70,000 barrels was apparent in some areas, notably West Texas, which was down about 15,000 barrels; the Gulf Coast about 13,000 barrels less; East Texas down 21,000 barrels; North Texas down 4000 barrels; and the Panhandle 5000 barrels under.

Standard of Indiana To Build Toluene Plant

Standard Oil Company (Indiana) has announced it has made a contract with the government to build and operate a toluene plant in the company's Whiting, Indiana, refinery. Construction is to start as soon as materials can be secured and contracts settled. Building is expected to require over a year. An Indiana subsidiary, Pan American Petroleum and Transport Co., has arranged to make toluene at its Texas City, Texas, refinery.

Franklin Cautions Guard Against Sabotage

Oil producers, refiners and pipe-line men have been urged by Wirt Franklin, Director in Charge of District No. 2, Office of Petroleum Coordinator, to employ all needed safeguards against sabotage of their properties and above all else to impress upon their organizations the need for alertness, day and night, in the protection of oil fields and refinery districts.

"We cannot assume" the statement said, "that the destruction of oil properties by Axis forces will be confined to tankers on the high seas. We must assume, instead, that attempts will be made to destroy the oil properties within the United States. No part of the country is precluded from such attempts.

"The oil industry through the Petroleum Industry War Council is now in process of organizing to protect oil properties from all forms of attack by saboteurs and vandals. The civil authorities have in many areas established certain precautions and some other forms of protection including committees under the Office of Civilian Defense have been provided.

"Obviously, however, much of the responsibility rests upon the oil companies themselves. Company management should keep before every employe the necessity of vigilance, day and night. No suspicious act should go unchallenged.

"Sabotage would first be directed at the refineries, the pipe lines, gasoline plants and storage. The most important destruction would be achieved in such installations. No phase of the industry, however, should be regarded as immune.

"The oil industry, like all other industries in this country, has been careless. It has seldom had cause to be otherwise. Today we face a new condition. We have enemies within the country as well as without. Those within our borders will leave nothing undone to aid their brethren outside.

"No oil operator, large or small, should longer permit strangers to come and go on the properties as they have in the past.

"In this attitude of being on guard we can profitably enlist the help of landowners in the oil fields.

"Let us think of the protection of our properties in terms of supplies to our fighting men. A refinery explosion, a gasoline plant fire or a dynamited pipeline station or major trunk line might mean disaster to a large force of our gallant troops or seamen."

Geologists Plan Conferences On War

The twenty-seventh annual meeting of the American Association of Petroleum Geologists will be held in Denver, April 22, 23, and 24, headquarters at the Cosmopolitan hotel. The sixteenth annual meeting of the Society of Economic Paleontologists and Mineralogists and the twelfth annual meeting of the Society of Exploration Geophysicists will be conducted jointly with the geologists.

The Rocky Mountain Association of Petroleum Geologists is serving as host for the meetings, but all arrangements are under the direction of the executive committees of the three organizations.

The association, in issuing a convention bulletin, said "it is believed that the need for the meetings is greater than ever before and that a great deal can be accomplished by a thorough study of the conditions which the war has imposed on us and by a concerted effort to adjust our scientific and technical resources to those requirements.

"The sacrifice of time, energy, and expense will be justified only by the accomplishment of constructive work which will increase the effectiveness of participation in the war effort."

Special conferences have been arranged to consider various essential problems. First will be held April 21, 8 to 11 p.m. by the research committee survey of oil discovery methods. A joint conference of the three groups on the application of geology and geophysics to war and post-war problems of the petroleum industry is scheduled from 2 to 5 p.m., April 22. A conference on war-time personnel problems is set for 8 to 10 p.m., April 22.

Short field trips will be conducted to spots of outstanding geologic and scenic interest at the nearby Rocky Mountain front on each day of the meeting.

ASME Houston Meet Includes Oil Topics

"Engineering Production for Victory" is the keynote of the program for the spring meeting of the American Society of Mechanical Engineers at Houston, March 23-25, at the Rice hotel.

Considerable portion of the program will be devoted to petroleum. E. DeGolyer of OPC will be one of the principal speakers on March 23. Other topics on that day include "The Operating Characteristics of Fluid-Actuated Pumps," by C. M. Rader and R. G. Ralph; "Pumping Equipment for Oil-Well Cementing," by W. D. Owsley; a motion picture, "Hughes Industrial Sound and Color Rock Bit Film," by F. L. Scott; "Redesigning of Field Tank Batteries for Conservation Purposes," by R. M. Stuntz.

On March 24, two petroleum papers will be presented, "The Metering of Petroleum Products as a Measure of National Defense," by L. R. Van Arsdale, and "Automatic Control of Natural Gas Fuel Power Boilers," by Charles W. Parsons.

API Hears Two Government Speakers At Southwest Gathering

For the industry to drill two wells where one might suffice constitutes sabotage of the nation's war effort, D. R. Knowlton, director of production for OPC, told the Southwestern district meeting of the American Petroleum Institute, Division of Production, in Dallas last week.

The industry must operate on a platform of procuring the greatest amount of oil with the least amount of steel, and should realize that in doing this it will be necessary for it to make many sacrifices, he continued. The steel situation makes it necessary that exceptions to M-68 be few and far between, Knowlton asserted.

At the same time, he stated he thought OPC officials had largely overcome the belief of WPB that a moratorium on drilling could be ordered due to the necessity that an adequate supply of petroleum products be available and the difficulties of rationing civilian use in the United States because essential travel could not be segregated from the non-essential.

A need for 3,600,000 barrels of crude oil daily was seen by the OPC (see report to WPB elsewhere in this issue) as the absolute essential minimum, and to supply this quantity it was estimated 19,000 wells would have to be drilled, Knowlton declared.

In closing, Knowlton pledged that OPC would soon be organized so it could handle exception applications efficiently, perhaps within 48 hours, and that this would be administered in as fair a fashion as he knew how.

Buck Speaks on Policies

Discussing "Procedural Policies," E. O. Buck, assistant director of production, District 3, Houston, explained why priorities are required to insure that the critical material find its way into necessary channels, pointing out that only a limited supply was available, and that only through priorities could the need of any business of industry be evaluated in terms of its contribution to war progress.

The speaker further urged the oil industry to change its viewpoint to that of foreign producers, 60 to 90 days away from supplies, and to endeavor so to rearrange inventories as to provide anticipated needs far enough in advance to permit the necessary replacements or repairs to be obtained in routine operations and to be on hand when needed, instead of requiring emergency handling at the time of actual need.

Further urging study of its records, Buck emphasized that the oil industry should not allow itself to be caught short, and that it must be adaptable to production of 3½ million or to step up the rate to possibly 5 million barrels per day.

Duty Is to Fight

It is everyone's simple and plain duty to fight now for our country as good soldiers, so that when the day of accounting arrives we shall have performed our job and be finally dismissed with the benediction of a "job well done,' asserted Judge Wallace Hawkins, Magnolia Petroleum Company, Dallas, who addressed a victory dinner Friday evening.

Since the outset of the war the oil industry has been delivering the right oil products where, when and in the quantities required, uninterrupted and without shutdown or lockout. In short, said Judge Hawkins, the industry is already organized for such wars as need be fought and is organized for this effort in the American war. Since the industry is so organized, its responsibility is to see the job well done without uncalled for interference, such gratuitous interference being met with deserved resistance.

Having been called to attention by our commander-in-chief, Hawkins declared that obedience to his orders is first duty, it being incumbent upon the industry to remain silent and use its whole efforts against the enemy despite possible accusation by other governmental branches of tax-dodging, illegal combination and to leave to the rigors of war itself to weed out the dreamy-eyed reformers, incompetents, fanatics and others who under guise of war effort snipe at the oil industry.

The remainder of the program consisted of operating and technical papers, abstracts of which follow.

R. O. Garrett Elected District API Chairman

R. O. Garrett, Arkansas Fuel Oil Company, Shreveport, was elected chairman of the Southwestern District of the American Petroleum Institute's Division of Production. He succeeds E. P. Hayes, The Texas Company, Houston.

J. Daviss Collett, with Associated Engineers, Houston, was elected vice chairman for the Texas Gulf Coast area. J. J. Metzger, with William Helis Company, New Orleans, is the new vice chairman of the Louisiana Gulf Coast. R. J. Dodson, Shell Oil Company, Kilgore, was named vice chairman for East Texas, and E. H. Griswold, Rushwold Oil Company, Midland, vice chairman for West Texas-New Mexico.

M. A. Wright, the Carter Oil Company, Shreveport, was named vice chairman for Arkansas-North Louisiana. Edgar Tobin, Tobin Aerial Surveys, San Antonio, was elected secretary-treasurer. Hayes becomes chairman of the advisory committee.

Garrett served as program committee chairman for the meeting. He also has served as chairman of the Ark-La-Tex Chapter of the API Production Division in Shreveport, Louisiana. He has served as vice chairman of the district and is active in many committees of the institute.

R. O. GARRETT

Paint Programs to Prevent Corrosion and Evaporation Losses

By Paul L. Lotz
Socony Paint Products Division, Socony-Vacuum Oil Company, New York

Discussing the mechanics of iron corrosion, the author points out the need for protection and defines certain prerequisites for effective paint coatings, such as cleanliness, dryness, and proper wetting of iron by binder of the paint used.

Need for both primer and finish coat if maximum protection is secured is emphasized, the fundamental differences between the coatings being explained. Special white paints are advocated, because of their outstanding solar reflectivity and the fallacy of tests under other than solar energy pointed out.

A tank-painting program specifying a white roof with aluminum or gray sides approaches optimum condition of maximum solar heat reflectivity, minimum evaporation losses, and lowest maintenance cost.

Caliper Logging in the Southwest

By C. P. Parsons, *Vice President, Halliburton Oil Well Cementing Company*

Caliper well logging, which consists of measuring the variations in diameter of the open hole in a well, is proving to have many practical applications.

By providing definite knowledge of the volumetric capacity of the annular space behind casing, the volume of

cement required to fill up to any desired height is determined easily. In addition many additional uses have been found for such logs.

In at least one field of South Louisiana, these logs are being used to ascertain the proper setting depth of surface pipe. It has been found that wells in this region wash out in the upper part, whereas below a certain depth the sands have a tendency to stand up to bit size, and this transitional point appears to be a logical depth to set surface pipe.

Caliper logging makes it possible to study the relation of varying hole sizes to the wobble of the drill string and to study results of various drilling techniques. Many problems encountered in formation testing are being cleared up by caliper logs, which show why failures may have occurred in the past and thus providing data that will increase future results.

If a well is to be gravel-packed, such logs will show the amount of gravel required, and also any irregularities in the shape of the hole. Results of acidizing and shooting can be determined by measuring the diameter of the hole. The volumetric capacity of the portion of a hole that is to be plugged off is shown by caliper logs. If necessary to run an open-hole packer, diameter measures will show the possible places where the packer can be set and the amount of expansibility required.

Several caliper logs were presented in the paper. One showed a condition wherein it was necessary to use 1250 sacks of cement whereas the bit size would indicate only 400 sacks would suffice. A thermal log showed the 1250 sacks reached the intended height. Such information can reveal thief formations or channeling of cement.

Other illustrations showed how caliper log data when combined with electrical and temperature logs could reveal stratigraphic information, where formation tests could be made, where side-wall cores, etc., could be taken.

Another illustration of three logs showed how calipers discovered why casing was collapsing in a West Texas field because of an eroded salt section that required much additional cement to fill the hole and how the logs could be used for geological correlations, due to the variation in shales and sands.

Subsurface Regulation of High-Pressure Condensate Wells

By John O. Farmer,
Otis Pressure Control, Inc., Dallas

Hydrocarbon hydrates which form as solids and accumulate on the downstream side of the surface controls and in restricted flow passages of wells producing oil and gas under relatively high pressures are a frequent cause of trouble in such field operations. Application of heat, requiring fuel, water-bath and other auxiliary equipment, is not an entirely satisfactory solution of the problem.

By bringing about the expansion of the well flow at some point where the consequent drop in temperature of the flow may be neutralized or the temperature again brought above the critical point, hydrates may be suppressed. Since the subsurface temperatures are more than sufficient to inhibit hydrate forming, it is evident that expansion of the gas-oil flow while within this zone will permit natural heat sources to maintain temperatures above the critical point, and to pass on the flow to the surface system with the hydrates unformed.

The author, detailing these requirements for subsurface pressure regulation in order to take advantage of inherent temperature gradients there, describes the development and operation of a type of subsurface regulator and amplifies his data with charts and tables for use in determining proper depths for pressure reductions to prevent hydrate formation.

Other beneficial results, accruing through subsurface pressure control, include the reduction and stabilization of gas-liquid ratios in condensate wells and the retardation of water encroachment. The possibility of establishing conditions in the tubing favorable to the precipitation of condensate through the use of subsurface regulators is suggested.

Further technical research relating to the use of subsurface regulators and pressures in the flow string to obtain conditions most conducive to the precipitation and an increased recovery of condensate is desired.

Back-Pressure Tests on Gas-Condensate Wells

By A. L. Vitter, Jr.,
Division of Minerals, Louisiana Department of Conservation, Baton Rouge, Louisiana

Advent of deep, high-pressure gas-condensate wells rendered unusable, without modification, back-pressure tests as standardized and used over the past decade. The paper proposes a modified method, identical in general principle, for new conditions.

The modified method assumes the general steady state equation of flow on any gas well to obtain, it being expected that the characteristic flow of a gas-condensate well would have a smaller value of the exponent and coefficient C than would hold with a dry-gas well.

Stabilization of gas-condensate wells must be attained before the equation will apply, stabilization resulting when rate of flow and well pressures become and remain constant. Linear velocity of flow must overcome the tendency to erratic or "slug" flow of the fluids, there being a certain minimum rate of flow below which a well will not stabilize.

Type of well completion may influence or greatly delay stabilization, it being desirable to check gas-oil ratio at frequent intervals and also to check condensate quantity. Stabilized flow is indicated both by gas-oil ratio and fluid delivery of the well.

Determination of sand pressures with bottom-hole bomb avoids calculations, but may be vitiated by liquid level in well or other factors. By means of formulas derived from the Weymouth formula as basis, the author works out an anlysis in which pressure drop due to flow and the weight of column of gas are calculated simultaneously for each increment in pipe length, and the sand-face pressure then arrived at by integration. The derived equation allows calculation of sand-face pressures without involving the use of differences of squares in the computation, which simplifies it considerably.

The author further carries out mathematical calculation of gravity and compressibility of the gas, a trial-and-error method being used or graphical solution obtained to compensate for initial assumptions regarding constant-temperature and compressibility data. Usually only two or three trials suffice to determine the factors.

Appended are sample calculations showing the application of the derived formula, together with pressure-depth survey and back-pressure tests as carried out by proposed method.

The proposed method is outlined for determination of sand-face pressures from well-head measurements, using published data on densities of gases and pressure drop due to flow. The author adds that a sufficient variety of gas-condensate wells have not yet been tested by this method to warrant general conclusions as to its applicability, and hopes that further investigation and consideration will be stimulated.

Multiple Zone Completions

By E. O. Bennett,
Continental Oil Company, Ponca City, Oklahoma

Fields having two or more separate and distinct hydrocarbon fluid-bearing strata should be treated as if each were a single zone field or pool. By this is meant that an operator should be able to control production rates from each zone independently of others below or above it, and that he should at any time be able to obtain formation pressures and bottom-hole samples from each zone for analysis:

While misuses of multiple-zone completions have occasioned criticism of the method, such a method has proved most advantageous and economical in many areas and if used would effect large savings in others. The author shows through a series of examples how pumping, flowing, gas-lifting and/or repressuring may be carried out simultaneously by properly arranged dual completions, the set-up being simply a mechanical problem susceptible of solution with proper equipment and management.

Further extension of dual completion practices permits single-zone operations to be extended to allow simultaneous return of gas pressure maintenance to the top of a thick sand, while producing oil by pumping, flowing or gas lift from the lower section of such sand.

One of the preliminary requirements of a multiple-zone completion is the insurance of an absolute seal between the two producing zones outside the casing. Where sufficient distance intervenes, the original cement job, properly centered, in formation cleaned of filter cake, and with adequate cement available, will in all probability effect the desired seal. Use of special heavy cement in wells drilled with heavy mud makes gravity displacement of the heavy mud sure, and prevents channeling.

After cementing, the casing is perforated opposite each producing zone as desired. A non-retrievable, drillable packer is then set in a blank section of the liner, between the two zones. The packer set, the setting drill pipe is backed off at the left-hand threaded joint and removed. Tubing string incorporating a "bullet" packer and side-door choke is then run and the packer set by putting weight on it after seating. After setting the packer and hold-down slips, strain is taken on the tubing

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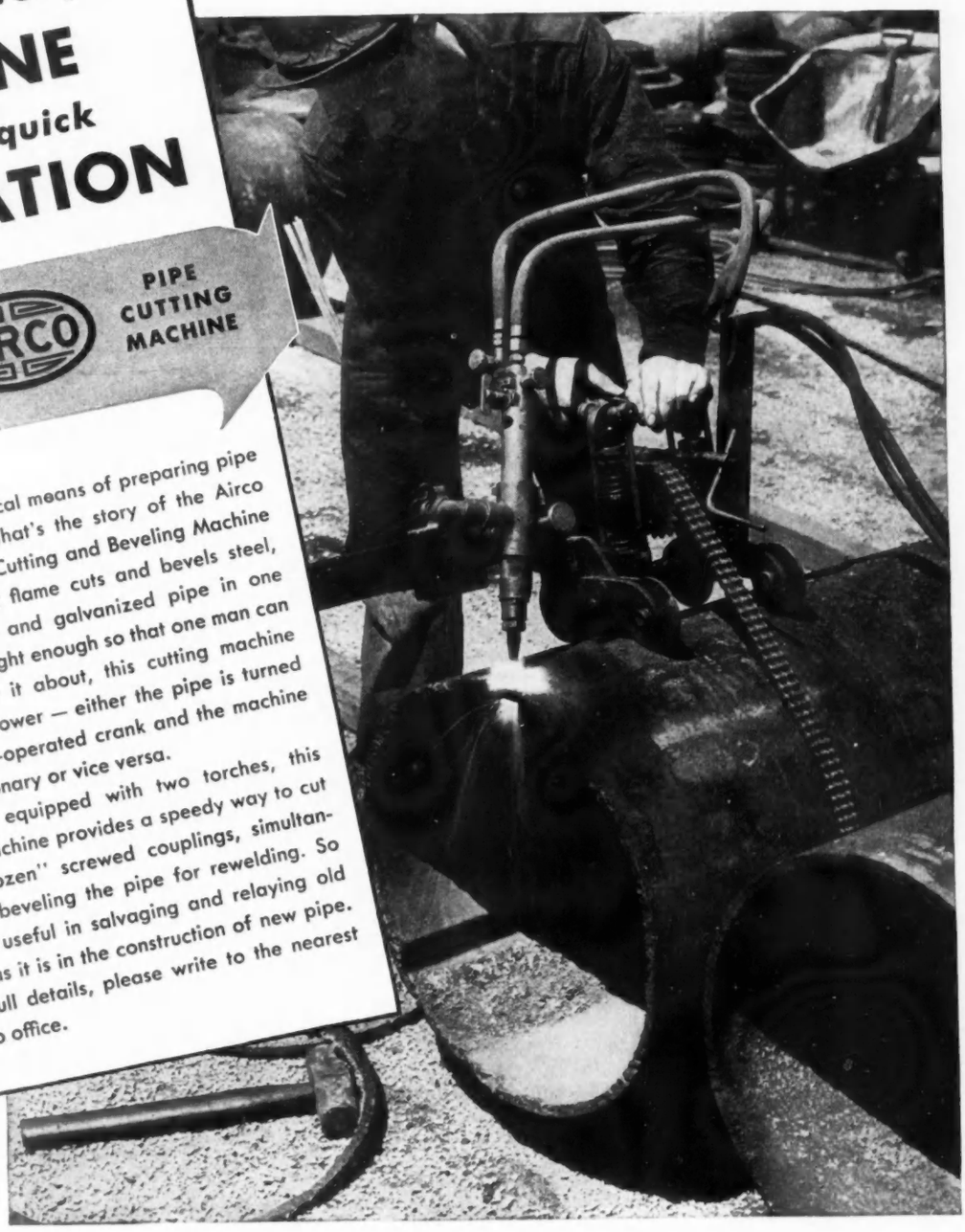

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Anything and Everything for GAS WELDING or CUTTING and ARC WELDING

to keep it straight for running instruments when desired.

Washing in of the well is done through the side-door choke and a blank bean then run to close the choke, and the well put on production. The body of the main packer is made long enough to take 4 or 5 bullet packers, which permits the tubing to be pulled and reset with new packer a number of times estimated as sufficient for the normal life of the well.

Tests for leakage between zones may be made by analysis of oil from the two zones, or injecting a mercaptan malodorant into one zone and analyzing the other zone production for it.

Use of dual completions is advocated for producers upon application to proper authorities, the author stating that permits should be granted only after an operator has satisfied such authority that his wells and producing formations are suitable and that he will use proper equipment.

Caution against flow rates from an upper sand sufficient to cut the tubing by jet action through upper zone perforations. Use of a synthetic rubber sleeve is advocated.

The author summarizes advantages of dual completions under proper handling as follows:

They save approximately 50 percent of the steel required for separate wells to the two zones.

They will permit most oil recovered per ton of steel and thus help maintain allowable requirements.

They will permit the draining of thin sands which otherwise would not justify drilling or completion of the well.

An edge well not commercially profitable in a single zone often can be completed in a two-zone area and recover large oil volumes otherwise irrecoverable.

Drilling time and equipment wear-and-tear is reduced approximately one half, with corresponding saving in completion costs.

Multiple-zone completions greatly reduce the cost of marine drilling where several zones may be reached from a single derrick.

Pumping of multiple-zone completions has been successfully carried out and will permit such wells to be operated in separated sands long after the flowing stage has passed or one sand becomes depleted.

In a field where pressure maintenance is carried out, the use of multiple-zone completions provides a great many more locations for possible gas injection than would otherwise be available.

Application and Value of Draw-Down Tests on Oil Wells

By J. Daviss Collett, Jr.
Consulting Engineer, Houston

The author discusses methods of testing wells, accuracy obtainable and accuracy required for practical use, followed by illustration of methods of placing data in useful form and the utility of such data. Limits of utility are suggested and the value of data and the costs of acquiring such data are quoted.

Factors affecting usefulness of data, such as saturations of reservoir formation, nature of reservoir content, sources of error, and other variables are considered.

A description of methods to be followed in taking draw-down tests is amplified to illustrate the accuracy with which potentials may be predicated through such tests. Stress is laid upon the need for obtaining accurate surface flow data, and for the providing of extreme care in securing these data. Calibration of instruments, for example, should not only be at atmospheric temperature, but also over the temperature range through which the instruments will function during an extended test.

The author summarizes his paper in the following conclusions:

Draw-down tests furnish data unavailable through any other source.

Care in making the tests is essential, both with the instruments and in handling the well. It is a job for experts only.

Carefully acquired data can be utilized in nearly all cases in plotted or graphic form, when properly interpreted.

The accuracy of bottom-hole-recording gauges is well above requirements for practical use. Properly run and calculated fluid level tests are also satisfactory.

No limits of utility can be placed on draw-down data for use by the practical engineer and production man. Limitations formerly placed on the use of data were caused primarily by failure to understand the complex nature of the problem.

The negative statement that no theoretical or practical study of reservoir behavior or of well and field behavior is complete without draw-down data best expresses the varied uses of the tests. Since conservation involves energy as well as products, the energy required to produce a well as shown by draw-down tests is necessary and vital data.

What goes on in the flow string and under what conditions the fluid enters the well bore is portrayed by the draw-down test. This is vital information and indispensable to the production man in setting out his program and settling his problem.

It is felt that all the early wells in new fields should have draw-down tests run on them and that the operator will profit still further if all wells are so tested, since the data can always be used at future times.

Finally it is necessary to do a great deal of study before a person is qualified to interpret properly draw-down tests. In support of this the author appends a comprehensive bibliography on the subject.

Improvements in the Treatment of Crude Oil-Water Emulsions

By R. C. Buchan,
Humble Oil & Refining Company, Houston

Pointing out that no oil-treating problem is such that complete standardization of equipment, chemicals and methods is practical, the author contends that each field and often each well is an individual problem. Operators find that oil-treating costs reflect the amount of work done to improve operations, both by study and by adaptation of newer methods.

Theory of treating oil-field emulsions shows that two things must be done: first, the water globules must be coalesced; second, the water and oil must be separated. Factors affecting the first are physico-chemical conditions, temperature, and time. Factors influencing the settling, assuming coalescence as practically complete, are degree of agitation in the settling chamber, temperature and time.

Companies manufacturing treating chemicals have maintained a vigorous research program, and excellent basic chemicals are available. Too often, chemical consumption alone is considered, when frequently the use is dependent upon the method of feeding.

Point of injection and proportioning of chemicals are important phases of any treating operation. Beam-operated, electric-motor-driven and gas-operated chemical feeders all have been developed, the latter being especially adapted to use with gas-lift or flowing production. Studies made to determine the proper points of injection and methods of feeding usually result in worthwhile chemical and labor savings.

Superdehydration and desalting is effective without undue cost when all production may be brought to a central treating plant, but otherwise is an added expense without adequate return. Practices which result in low salt and water content appear worthwhile when the crude so treated is not contaminated with less clean crude during transportation, and is feasible in some cases as a means of reducing corrosion in pipe lines and tankers. In general, producers have no equipment available for low-cost treating of relatively small volumes of fluid.

Concluding, the author states that those familiar with emulsion-treating problems know that the factors involved are continually changing. It is suggested that continued study of available methods and their application is required for optimum results and for further improvement.

Well Spacing and Lease Allowables Based on Rates of Recovery And Unitized Pressure

By Park J. Jones, *Petroleum Engineer Fort Worth, Texas*

Allocation of allowables based on equal opportunities to produce oil is necessary but is not sufficient. An incentive in the form of higher allowables for efficient production is needed. Such an incentive in the relative producing efficiency which stems from, and can be applied readily under, the concept of unitized pressure. As the fundamental principles controlling production of oil are such that dissipation of reservoir pressure causes avoidable underground waste and increases the cost of producing oil, it is necessary to utilize pressure efficiently. The aim of this paper is to derive quantitative expressions for well spacing and allocation of lease allowables which would enable operators to produce oil efficiently on all types of reservoirs.

It appears that unitized pressure can achieve what is claimed for unitized acreage without involving the difficulties inherent in the latter. Voluntary unitization of certain acreage and of small tracts insufficient in themselves to support a well would probably be the rule rather than the exception.

The author submits that if lease allowables were made proportional to rates of recovery and relative producing efficiency, avoidable underground waste, production costs and steel consumption would be minimized.

The discussion is concerned mainly with newly discovered reservoirs, although parts of it apply directly to

some reservoirs already developed. Inferentially, it is also submitted that if field allowables be made proportional to rates of recovery and producing efficiency it would, in addition, (1) provide uniform payouts as between fields insofar as it is physically and economically possible to do so by absorbing differences through spacing; (2) provide a reliable method for determining optimum rates of recovery, and (3) provide a scientific basis for pricing crude oil.

A series of graphs showing spacing versus first cost against millions of barrels of ultimate recovery permit the determination of spacing in terms of the desired payout, having available such basic data as virgin reservoir and bubble-point pressures, volume factor for oil, probable sources of pressure—whether water drive or gas drive, type of pay, approximate pay thickness porosity and permeability. These data plus structural and stratigraphic information are sufficient for making conservative estimates as to ultimate recovery, operating methods, operating costs, and rate of recovery.

Tabulated illustrative examples demonstrate the applicability of the plan.

Russia Expects to Increase Oil Output

All 1941 requirements for the oil industry were met in Russia and production is expected to increase despite war conditions, I. K. Sedin, Commissar of the oil industry, has announced. Sedin declared various improvements in refining methods are making it possible to produce high-octane aviation gasoline from practically any Russian oil.

Crude production last year in the "second Baku" region lying between the Volga and the Urals topped 1940 production by 11.3 percent. Output this year is scheduled to be increased in the Ural fields, which would be out of reach of the Germans even if they reached the Caucasus, and development of new fields farther east is planned. Sedin declared production of lubricants this year will be doubled.

Colombian Company Drops Two Operations

Colombian Petroleum Co. has suspended operations in two tertiary wildcats on the Barco. North Sardinata 1, total depth 5005 feet, was a dry hole. South Sardinata 1, 4 miles south of the other test, reached 4717 feet but showed only small, noncommercial production. These tests were south of the Petrolea field and were drilled to explore tertiary sands around 4200 feet.

Two other wildcats, Socuavo 1 and Tres Bocas 2-A, were testing at 9100 feet and drilling at 8582 feet, respectively.

Recent Magdalena Valley wildcat operations include one suspension, several wells drilling and two new locations. Tropical Oil Co.'s Cimitarra 1 was reported temporarily suspended on the Gutierrez concession after drilling to 9502 feet. McCarthy 1 of Carara Petroleum Co. was drilling at 3700 feet following a hole straightening job. Braval 1, of a Richmond Petroleum Co. affiliate, had reached 2161 feet. Site for Braval 2 was being cleared. On a 48,568-hectare tract held by Star Petroleum Co. of Colombia, a Shell affiliate, El Dificil 1 was being rigged up.

California Proration Schedule Given Approval by Coordinator's Office

General pattern for crude oil proration in California in the months ahead has been established with acceptance by the Petroleum Coordinator's office of production schedules covering February operations worked out by the California industry. Distribution of allotments to individual fields was given approval on February 20. While it is anticipated major revisions may be made in future months in the system devised to distribute February allocations, a working basis has been established from which to proceed in future.

The February allocation schedule for California is the first to receive approval of the coordinator's office as the January schedule was never officially recognized, due apparently to its failure to incorporate certain of the principles set up under Recommendation No. 19. However, in submitting the January schedule to Washington it was pointed out that time did not allow the marshalling of necessary engineering details to permit application of a production schedule on the basis of fundamental points detailed in Recommendation No. 19.

The California production quota for February was set at 632,300 barrels daily. Of this amount, 5300 barrels daily was reserved for assignment to new, recompleted, resumed and re-equipped wells, leaving 627,000 barrels daily to be distributed in direct field allocations.

The February quota distribution in California was arrived at by establishing minimum production rates for each pool below which continuity of production could not be maintained on the basis of prevailing operating costs in the district. Satisfaction of economic necessity in maintenance of output required an estimated 273,958 barrels daily of the 627,000 barrels daily quota remaining after deducting 5300 barrels daily for new and reconditioned wells. The 353,042 barrels daily remaining quota of the original 632,300 barrels daily state quota was distributed to the various pools by application of a power

TABLE 1

California Fuel Oil Data (For Redistribution of February Primary Quota)

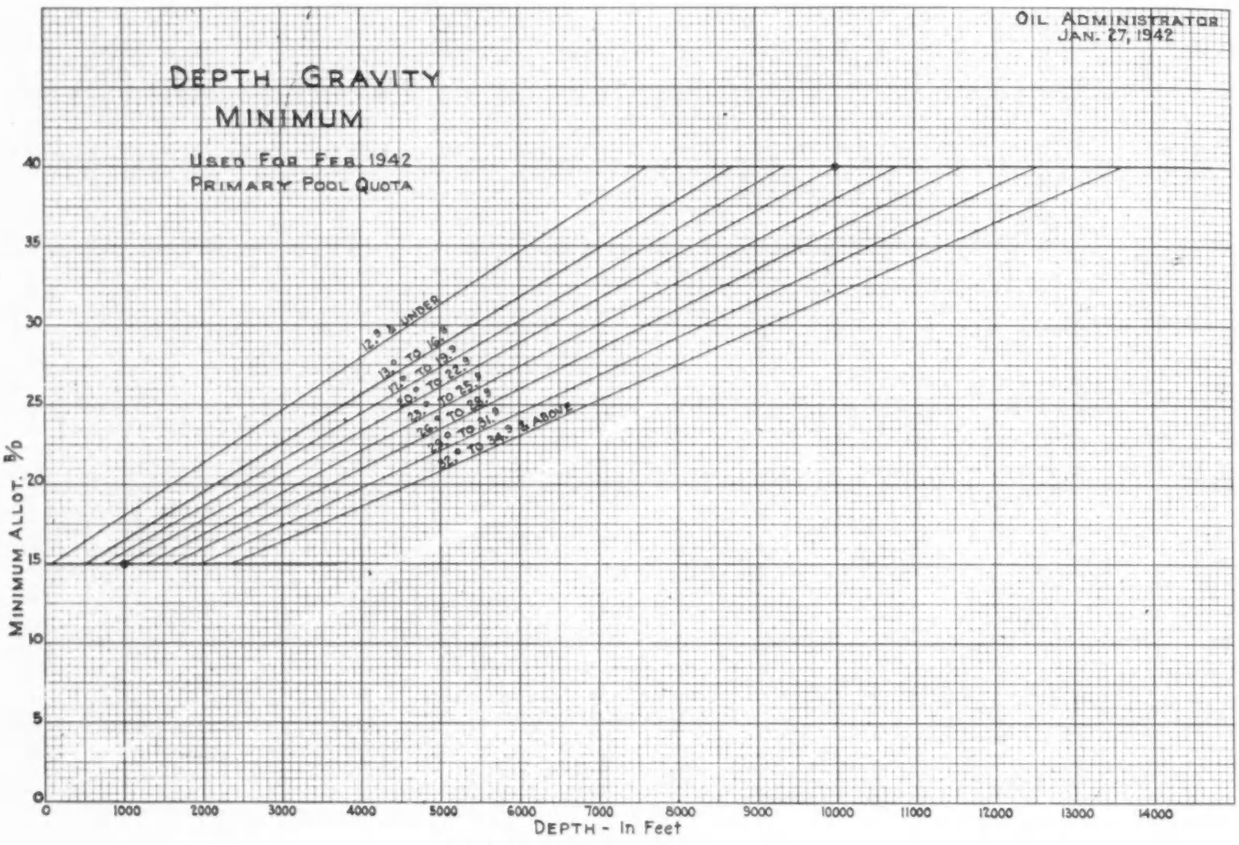
GRAVITY	Fuel Percent Yield	4th Quarter 1941 Average Prod. B/D	4th Quarter 1941 Fuel Yielded B/D	February Primary Quota Crude B/D	February Primary Quota Fuel B/D	Increase or Decrease B/D Crude	Increase or Decrease B/D Fuel
Heavy:							
Under 16	.99	83,084	82,253	68,657a	67,970	+ 3,938	+ 3,886
Under 18	.90	20,607	18,546	60,953	54,858	+ 5,724	+ 5,135
Under 20	.83	49,785	41,322	20,651	17,140	+ 454	+ 376
Under 22	.76	27,130	20,619	32,076b	24,378	+ 1,951	+ 1,478
Under 24	.70	44,245	30,972	57,517	40,262	+ 2,477	+ 1,729
Under 26	.64	79,742	51,035	78,681	50,356	+ 2,796	+ 1,785
Under 27	.595	49,380	29,381	45,478	27,059	+ 143	+ 85
Total	.77	353,973	274,128	364,013	282,023	+17,483	+14,474
Light:							
Under 28	.57	10,766	6,137	11,919	6,794	— 13	— 7
Under 30	.53	37,646	19,952	21,960	11,639	— 186	— 99
Under 32	.48	86,294	41,421	95,389	45,787	— 1,711	— 821
Under 34	.43	37,983	16,333	29,929	12,869	— 545	— 234
Under 36	.38	30,297	11,513	24,854	9,445	— 987	— 375
Under 38	.33	48,925	16,145	38,743	12,785	— 1,791	— 591
Under 40	.29	21,892	6,349	18,620	5,400	— 794	— 230
40° & Over	.22	14,217	3,128	*6,377c	1,403	— 343	— 75
	(.17)	.....	.....	†4,328	736	— 245	— 42
Total	.424	288,020	120,978	252,119	106,858	— 6,615	— 2,474
State Total	.63	641,993	395,106	616,132	388,881	—10,868	—12,000
Short	...	.....	.....	10,868	.....	.....	.....
Quota	...	.....	.....	627,000	.....	.....	.....

a 7,209 deducted to reduce Santa Maria Valley to 12,000 barrels a/c transportation.
b 3,474 deducted to reduce Capitan Vaqueros to 0 barrels a/c transportation.
c 185 deducted to reduce Capitan Sespe a/c transportation

10,868 Total

* Under 45°. † Over 45°.

	Per Plan IIIA-1
Three months' average theoretical production fuel oil	395,106
Additional fuel required	8,775
Total fuel required	403,881
Primary quota theoretical fuel yield	388,881
Deficit	15,000
February New Wells 5500 B/D—Estimated fuel yield .55	3,000
Net Increase of fuel required	12,000



California Allotment Plan Chart.

factor based on a power factor reduction as applied to the average per-well maximum efficient rate after deducting the minimum rate.

The minimum production rates necessary to maintain continuity of production gave consideration to average operating and lifting costs in 226 pools over the state, based on known field conditions and entailed primarily the twin factors of well depth and gravity of oil produced. Oil of 23-gravity was taken as the mean, or base gravity.

In applying depth-gravity measurement to minimum production rates a 1000-foot well producing 23-gravity product was assigned a minimum quota of 15 barrels daily, while a 10,000-foot well yielding a similar product was given a minimum of 40 barrels daily due to greater lifting cost entailed, and limited in all cases upon the ability of the individual well to make such minimum rates of output.

Crudes of 12 gravity and less were given a 20 percent increase over the base minimums, while crudes of 32 gravity or over were decreased 20 percent below the base minimum with proportionate adjustments for intervening gravities.

Due to the unprecedented demand for fuel oil on the West Coast and heavy storage withdrawals over an extended period, special consideration was given to pools yielding high percentages of fuel from crudes produced. Minimum allotment adjustments for heavy crude did not yield sufficient heavy crude. Accordingly a further addition to quotas for heavy oil pools was found necessary. In adjusting allocations for this fuel increase, wells producing less than 27-gravity crude were assigned graduated increases in quotas in ratio to actual fuel-oil yield as related to crude gravity, while crudes of lighter gravity yielding less fuel oil per barrel were given quotas with increasing discounts downward as gravity increased.

Table 1 reflects application of adjustments by gravity in heavy and light crudes produced in California. It will be noted that average fuel oil yielded by the state in the fourth quarter of 1941 was 395,106 barrels daily, of which 274,128 barrels daily was derived from crudes under 27 gravity, and 120,978 barrels daily was from crudes over 27 gravity. The redistribution of quotas for February to increase fuel-oil yield increased the output of fuel from crudes below 27 gravity from 282,023 barrels daily to 296,497 barrels daily. This 14,474 barrels increase in fuel required the addition of 17,483 barrels daily of crude output. Fuel yield of 106,858 barrels from oil above 27 gravity was reduced 2474 barrels daily by cutting 6615 barrels daily from light crude output, thus leaving a net increase of 12,000 barrels daily in fuel after application of gravity adjustment to both light and heavy oils.

In addition to the establishment of minimum economic rates of output for individual pools, the February allocation setup also established a maximum efficient rate of output for the state. This maximum efficient rate was predicated on actual capacity of fields to deliver oil over a 180-day period, but in a larger sense is that rate of output which will insure the greatest ultimate oil recovery under economic operation.

Establishment of a maximum efficient rate of production over a 180-day period was based upon actual producing capacity under good operating practice giving due regard to maintenance of reservoir pressures, control of water encroachment, satisfactory gas-oil ratios, and general conservation considerations in production. The individual pool was taken as the unit for establishing maximum production rates, rather than capacity of individual wells.

Maximum efficient rate for settled, intermediate and flush fields over the state for February was estimated at 900,476 barrels daily.

In compiling data on minimum producing rates and maximum efficient producing rates, it was determined that a number of pools were capable of making only the minimum, or slightly more than the minimum rate of production needed to maintain operations.

In those pools where the quota determined under the power factor used was more than 90 percent of the pool's maximum rate, such pools were then classified as stripper pools and all wells exempt from curtailment up to a maximum of 75 barrels daily per well. Likewise, intra-field allocation in all pools called for exemption of wells if formula used provided a base allotment of more

than 90 percent of maximum efficient rates of production.

Application of the 90 percent rule resulted in exempting from curtailment some 2000 wells, in addition to about 10,000 wells already exempted under the minimum production formula, or resulting in about 12,000 wells out of 18,500 wells considered being placed in exempt classification.

Establishment of minimum rates of production for stripper fields resulted in elimination from curtailment consideration of 90 pools out of the state's 226 listed pools.

Necessity of increasing fuel-oil yield required minor adjustments in primary quotas for curtailed pools as already stated. An additional modification of the primary quota was found necessary in the case of two fields where dislocation of transportation had affected the delivery of crude, resulting in a transfer to other fields from the affected area of 10,868 barrels daily in quota.

Final pool quotas established after giving consideration to all adjustments are distributed to individual wells within pools on a basis consistent with that used to determine pool quotas, except where operators in a given field had previously developed an intra-field program consistent with Recommendation No. 19 and which had been approved by the District 5 production committee.

The transfer of quota from light oil fields to heavy oil fields to increase the yield of fuel oil reduced the yield of natural gas from all California fields by 131,000,000 cubic feet daily under the level of output obtaining during December, 1941. The reduced rate of gas output, however, was only 11,000,000 cubic feet less than the anticipated February natural gas requirements.

A primary problem in adjusting proration procedure in California to meet marketing needs under the war program centers on maintenance of the flow of natural gas at a level to satisfy all elements of demand. As cuts are made in light gravity, high gas producing fields to increase the output of those fields yielding a high percentage of fuel-bearing crude, sharp impairment in natural gas production follows. The production of aviation fuel blending stock from treatment of natural gas is also a factor of major importance in meeting demands made upon the industry. In part, at least, shortages in natural gas from oil-producing activities can be compensated for by the opening up of dry gas field reserves in the San Joaquin Valley.

Studying Heavy Oil Situation in California

A study of the heavy oil situation in California is being undertaken by the District 5 Office of the Petroleum Coordinator for National Defense. The study will include compilation of data as to reserves of heavy oil, possibilities of new discoveries, well-spacing required for maximum ultimate recovery, and the amount of pumping equipment necessary to equip leases for maximum output.

"The study is designed not only to determine existing conditions as to heavy oil reserves and supplies in California, but also to furnish the data necessary to formulate a policy for exceptions to Conservation Order M-68," Lt. Commander W. H. Osgood, director in charge of the district office declared in announcing the study.

This order, issued by WPB establishes the conditions under which material can be purchased or used in oil industry operations. In general it restricts new drilling to one well to 40 acres, and the installation of pumping equipment to one well to 10 acres. The oil industry has maintained that these general provisions do not fit California conditions, and that the restrictive effect of the order tends to cripple the California industry.

California's heavy oil supplies are of increasing importance in the conduct of the war in the Pacific, since other sources of supply of fuel oil have been cut off or endangered by the Japanese.

Two Oil Institutes Organized in Colombia

Colombia has 2 petroleum institutes, both recently organized, and may have a third. One organization is the Instituto Colombiano de Petroleos, whose president is Felix Mendoza, director of the statistical section of the national ministry of mines and petroleum. The other group is the Federacion Colombiana de Minas y Petroleos, previously headed by the late General M. Ospina Vasquez. Secretary is Dr. Gustavo Arbelaez Hurtado.

Colombian oil men are considering organization of a Colombian section of the South American Petroleum Institute, which at present has national sections in Uruguay, Peru, Argentina and Chile.

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Eastern Shortage Cuts Crude Buying, Boosts Rail Shipping

War's interference with operation of tankers has caused backing up of oil supplies in the Southwest and the necessity of curtailing crude purchases, despite emergency stepping up of movements by railway tank car in partial compensation for the curtailment of shipping by water.

Seven crude oil purchasers have curtailed takings in West Texas and Southeastern New Mexico, and now are taking only from 60 to 77½ percent of the daily allowables set by state authorities.

Magnolia Petroleum Co. cut back to 60 percent effective March 1 in West Texas, and some restrictions applied to New Mexico purchases, which are handled by another carrier, retroactive to February 19. Humble Oil & Refining Co. applied the minimum figures in New Mexico and West Texas effective February 20, with exceptions made in the Yates and World-Powell fields, aggregating 5800 barrels daily, due to their high octane rating. The four owners of the Texas-New Mexico Pipe Line Co. readjusted their curtailment retroactive to February 19 to 65 percent of the allowable. Atlantic Pipe Line Co. instituted pipe line proration on February 10 with purchases held to 77½ percent of the daily allowable, and on February 17 discontinued accepting deliveries of Comanche Pipe Line Co. from the Apco - Warner pool, Pecos County, which has 16 wells that produce low octane oil from Ellenburger. Stanolind Oil & Gas Co. applied a 25 barrel daily allowable quota effective February 23 to its wells in the Slaughter and Cedar Lake fields, as this oil is consigned to Humble, using the facilities of 4 companies in making deliveries to Baytown, Texas.

Further success was achieved in the week ended February 21 in boosting railway tank car shipments of oils to the East Coast, the latest report of the OPC having shown that 10,162 cars moved into the region 2,286,450 barrels of crude oil and products, an average of 326,636 barrels daily, a new record. In the previous week 7987 cars brought in 1,797,305 barrels, or 256,725 daily.

Shipments by the several companies during the week of February 21 were reported to the OPC as follows: Atlantic Refining Company, 476 cars; Cities Service Co., 337; Continental Oil Co., 36; Gulf Oil Corp., 800; Pan American Petroleum & Transport Co., 1168; Pure Oil Co., 110; Shell Oil Company, 866; Sinclair Refining Co., 595; Socony-Vacuum Oil Co., 1178; Standard Oil Co. of Kentucky, 71; Standard Oil Co. of New Jersey, 2559; Sun Oil Co., 561; The Texas Co., 1202; Tide Water Associated Oil Co., 203.

Tank car rental agencies have depleted their supplies of both clean and dirty tanks, according to a Southwestern representative of one of the large tank car companies, and are putting forth every effort to locate idle or seldom-used cars in the hands of their customers as well as non-customers such as refiners that have their own fleet. They have had considerable success in inducing those with cars that are not working to divert them where most needed.

Crude movement from the East Texas field, in particular, is increasing. During the week ended February 18, Atlantic Refining Co. shipped a daily average of 7012 barrels over its 46-car rack at Kinsloe station to Philadelphia, starting over the Missouri Pacific lines. In the same period Magnolia Petroleum Co. shipped an average of 3396 barrels daily over Tidal Pipe Line Co.'s 20-car rack on the T. P. railroad, to Socony-Vacuum's plant at Smithville, New York. Atlantic is likely to step up its movement to 10,000 barrels daily and Magnolia to between 5000 and 6000 barrels daily.

Crude Oil Production in the United States Down

(Estimates compiled by The Oil Weekly. All figures indicate daily averages, in barrels)

STATE OR DISTRICT	[1]OPC Allocation in February	PRODUCTION IN WEEK ENDED Feb. 21	Feb. 28
Arkansas	[2]74,500	74,150	73,400
California	[3]632,300	655,600	648,200
Long Beach		37,100	38,100
Midway-Sunset		49,300	45,800
Kettleman Hills		33,100	27,400
Wilmington		91,200	92,000
Rest of State		444,900	444,900
Colorado	6,500	6,550	5,650
Illinois	371,800	347,550	333,800
Salem		46,200	45,900
Louden		56,000	55,700
Other New Pools		233,750	220,350
Old Pools		11,600	11,850
Indiana	17,200	17,550	17,050
Kansas	[2]251,700	247,100	230,900
Kentucky	12,500	10,350	12,400
Louisiana	[4]335,000	353,350	352,250
North		80,200	81,200
South		273,150	271,050
Michigan	[2]47,000	52,600	50,750
Mississippi	57,400	89,650	92,100
Missouri		125	125
Montana	20,400	21,600	21,750
Nebraska	5,200	4,450	4,425
New Mexico	[2]119,300	120,650	121,100
New York	14,700	12,800	12,800
Ohio	9,000	12,300	9,750
Oklahoma	[2]395,300	396,750	393,700
Oklahoma City		76,400	83,450
Seminole Area		103,900	101,300
Rest of State		216,450	198,950
Pennsylvania	48,000	50,950	51,050
Tennessee		30	30
Texas	[5]1,596,000	1,515,600	1,516,550
Upper Gulf Coast		298,150	297,050
East Texas Field		369,050	368,250
Rest of Eastern Texas		91,000	91,650
Lower Gulf Coast		126,400	126,550
Southwest Texas		73,950	75,550
South Central Texas		22,050	21,100
West Texas		298,850	300,800
North Texas		149,000	148,550
Panhandle		87,150	87,050
Utah		15	15
West Virginia	10,000	9,500	9,550
Wyoming	78,000	89,100	86,900
Total United States	4,101,800	4,088,320	4,043,345

[1] Production rates recommended for states by Office of Petroleum Coordinator, on basis of Bureau of Mines forecast of the nation's daily average requirements for domestic crude during month.

[2] OPC allocation adopted by state conservation authorities as allowable production.

[3] OPC allocation also represents allowable production, the state quota being distributed among fields by Conservation Committee of California Oil Producers, acting under OPC supervision.

[4] Louisiana Department of Conservation set allowable at 344,955 barrels daily for February.

[5] Under Texas Railroad Commission proration order for February, actual production in Texas was expected to average 1,543,739 barrels daily at beginning of month, allowing for usual under production of 3½ percent below net allowable, which was figured at 1,606,389 barrels daily as of February 1. However, allowable normally increases as new wells are completed, and actual daily average production for month may be expected to be slightly greater than average as calculated for February 1. Under February order, most Texas fields were ordered shut down February 4, 8, 14, 15, 21, 22, and 28.

Statistics Reflect Retarded Movement of Oils to East

Statistics of the week ended February 21 embodied evidence of the difficulties of moving oils from the Gulf Coast and the Caribbean to the Atlantic seaboard. East Coast refineries apparently were furnished more crude than in the previous week and were able to step up runs to stills by 53,000 barrels to 566,000 daily (nearly 80 percent of capacity), and daily average gasoline production was increased 5000 barrels. But receipts of gasoline from the Gulf Coast were below normal, and East Coast stocks were increased less than normally for the time of year in expanding only 175,000 barrels. The present total of 19,492,000 barrels in the district is only about the same as that on hand at the beginning of the year, although January and February normally bring a substantial build-up. On February 28 last year, the East Coast stocks of finished and unfinished gasoline totaled 20,082,000 barrels.

The most significant evidence of the transportation trouble was embodied in figures on stocks of both light and heavy fuel oils. East Coast inventories of gas oil and distillate fuel were reduced by 1,275,000 barrels in the week of February 21, after which they totaled 9,053,000 barrels. Withdrawals are customary at this season, but reductions have been above normal since the beginning of the year, and the February 21 total of approximately 9,000,000 barrels compares with one of about 12,650,000 barrels on hand February 28 last year.

Residual fuel oil has become seriously scarce on the East Coast, and the shortage was accentuated in the week ended February 21, when practically a million barrels had to be taken from storage, as receipts from the Caribbean and the Gulf Coast lagged. The 7,590,000 barrels in storage after the week's withdrawal of 996,000 barrels compared with 8,846,000 barrels reported for the district by the Bureau of Mines as of February 28 last year.

On the Texas Gulf Coast, which accounts for nearly one fourth of the country's refining capacity, runs to stills were reduced 17,000 barrels to 1,003,000 daily (88.8 percent of rated capacity), and daily average production of gasoline was cut 20,000 barrels, and still there was an increment of 1,237,000 barrels in gasoline stocks, as tankers were not available to move supplies normally. The inventory practically reached 20,000,000 barrels as of February 21, whereas stocks totaled only 16,408,000 barrels on February 28 last year. Similarly, gasoline stocks on the Louisiana Gulf Coast are well above a year ago, having totaled 4,495,000 barrels February 21, 1942, against 3,470,000 on February 28, 1941, although the week of February 21 brought a 232,000-barrel withdrawal. For the Gulf Coast as a whole, there was practically no change during the week in stocks of gas oil and distillate fuel oil, and stocks of residual fuel oil were increased 130,000 barrels, or nearly 20,000 barrels daily.

Statistics for the week of February 21

were not abnormal for the districts other than the East Coast and the Gulf Coast. California stepped up refinery runs 28,000 barrels daily and added gasoline to storage but took from storage both light and heavy fuel oils, although not in abnormal volume.

For the United States, the week's statistics were featured by the setting of a new high in gasoline stocks. The inventories of finished and unfinished gasoline were increased 2,516,000 barrels to a peak of 104,312,000 barrels as of February 21, which compared with the previous record of 102,817,000 barrels that was set April 20, 1940. The peak for 1941 was 99,727,000 barrels, reached March 29. On the Texas Gulf Coast, several refiners reported storage tanks full or virtually full, and several had either closed down, pending arrival of tankers, or expected to do so shortly. The above total of 104,312,000 barrels for February 21 was nearly 10,000,000 barrels (10 percent) above the amount of gasoline on hand in the United States February 21 last year.

Refinery runs of all plants in the country averaged 3,889,000 barrels daily (83 percent of capacity) in the week ended February 21, up 117,000 from the previous week, with most districts showing gains. The operations were 321,000 barrels daily (9 percent) higher than in the corresponding week last year.

Distillate fuel oil stocks now are practically the same as a year ago at 35,698,000 barrels. Residual fuel oil stocks are 8,000,000 barrels (8 percent) lower. Stocks of crude oil totaled 254,463,000 barrels on February 14, 1942, and were about 6,500,000 barrels (2½ percent) under the 260,948,000 barrels reported for corresponding date last year.

Crude Production Lower; Mississippi at New High

United States crude oil production averaged 4,043,345 barrels daily in the week ended February 28. That was approximately 45,000 barrels less than the daily output in the previous week and 58,000 less than estimated daily average requirements for domestic crude in February, as forecast by the Bureau of Mines.

The decrease of the week was accounted for largely by California, Illinois, and Kansas, although there were small declines also in Arkansas, Colorado, Louisiana, Michigan, Oklahoma, and Wyoming. Texas was practically unchanged.

Mississippi again reached a new high, having averaged 92,100 barrels daily, although the Office of Petroleum Coordinator recommended daily average production of only 57,400 barrels daily in February.

Federal Oil Taxes Jump in January

Collections from the federal oil taxes in January showed an increase of more than $9,000,000 over December, with revenue from the tax on gasoline reaching the highest figure for any month since last August, it was reported February 24 by the Internal Revenue Bureau.

Gasoline-tax collections for the month were reported as $37,798,127 against $29,288,192 for December and $23,306,897 for January, 1941.

Revenue from the levy on lubricating oils reached $3,907,268, compared with $2,905,961 for the preceding month and $2,340,219 for the corresponding month last year, and returns from the impost on pipe line transportation were $1,196,138, compared with $1,041,006 for December and $918,290 for January a year ago.

Illinois Issues Rules For Water Flooding

Rules and regulations for water-flooding of oil properties were adopted February 20 by the oil and gas division of the Illinois department of mines and minerals.

Under provisions of the rules operators must keep applications on file in division offices for 10 days. Records must be kept of water injected into oil-bearing strata, the amount of oil produced therefrom, pressure maintained on water intake wells to flow oil, and pressure maintained on water intake wells to pump oil.

All operating data within 1320 feet of the boundary of property to be flooded must accompany applications. Provision was also made for filing objections to flooding within 10 days, and for hearings on complaints.

Superintendent G. C. Curtis said the new rules were prepared after operators planned extensive secondary operations in the Westfield pool and adjoining areas in Clark County.

OPC Recommends

[*Continued from page 49*]

the rise in crude stocks being offset by an unusually large seasonal reduction in refined stocks, particularly of fuel oils.

"This situation may be attributed to the disturbance of regional movements in the East Coast and West Coast districts, to uncertainty as to the future trend of gasoline demand due to tire rationing, and to a consequent readjustment in refinery operations reflected in a reduction of total runs with abnormally high seasonal yields of gasoline and low seasonal yields of distillate and residual fuel oils.

"While the demand for all oils may be reduced materially if rationing becomes necessary in the East Coast, the current rate of crude runs seems lower than is warranted by the trends of total demand and further large decreases in national stocks of refined products seem undesirable.

"During 1942 increasing war and export requirements will probably at least balance any curtailment in civilian consumption of all oils," the bureau said. "Starting from the high level of demand at the end of 1941, when large defense requirements were combined with peak civilian demand, the first half of 1942 should show a substantial increase over

Trends of Operations and Changes in Stocks

Figures are from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines' basis, except those on crude stocks, which are from Bureau of Mines weekly reports.

WEEK ENDED	Crude Oil Production (Barrels Daily)	Crude Runs to Stills (Barrels Daily)	Crude Oil Stocks (Barrels)	Gasoline Stocks (Barrels)	FUEL OIL STOCKS	
					Gas Oil & Dist. Fuels	Residual Fuel Oil
1939:						
February 18	3,324,300	[6]3,125,000	271,252,000	83,075,000	23,747,000	111,349,000
April 22	3,526,700	3,280,000	277,156,000	[2]87,769,000	21,085,000	105,035,000
April 29	3,568,200	3,405,000	278,440,000	86,794,000	[7]25,844,000	[7]108,409,000
May 6	3,580,900	3,275,000	[2]278,607,000	86,216,000	26,167,000	108,597,000
August 5	[2]3,909,400	3,445,000	268,982,000	76,431,000	35,601,000	114,512,000
August 26	[1]1,600,800	3,475,000	246,982,000	73,475,000	37,722,000	[2]116,237,000
October 7	3,435,850	3,505,000	231,564,000	[6]71,152,000	38,549,000	114,397,000
October 21	3,771,550	[2]3,650,000	[3]229,127,000	72,122,000	39,358,000	115,060,000
October 28	3,498,500	3,520,000	230,453,000	72,660,000	[2]39,562,000	114,786,000
1940:						
January 6	3,584,450	[6]3,370,000	238,581,000	82,002,000	32,183,000	105,247,000
February 10	3,688,100	3,460,000	239,510,000	91,649,000	26,007,000	[6]102,344,000
March 16	[2]3,890,050	3,500,000	246,762,000	100,616,000	24,075,000	103,558,000
April 6	3,745,000	3,455,000	251,897,000	101,690,000	[6]23,551,000	105,099,000
April 20	3,858,550	3,535,000	254,881,000	[2]102,817,000	24,779,000	103,323,000
June 22	3,846,450	[2]3,690,000	260,891,000	97,276,000	32,751,000	104,683,000
September 14	3,647,400	3,580,000	262,475,000	83,300,000	46,648,000	[2]109,135,000
October 19	3,667,550	3,525,000	262,098,000	81,656,000	[2]49,051,000	108,141,000
November 9	3,584,200	3,510,000	261,631,000	[6]79,847,000	48,408,000	107,687,000
November 30	[6]3,335,050	3,510,000	262,679,000	80,284,000	46,212,000	106,618,000
1941:						
January 4	3,367,200	3,600,000	260,643,000	85,053,000	42,403,000	[2]102,448,000
January 11	[6]3,364,450	3,565,000	259,342,000	86,328,000	41,094,000	102,281,000
January 18	3,611,900	[6]3,490,000	259,934,000	87,351,000	39,920,000	101,213,000
March 29	3,746,550	3,625,000	[2]266,187,000	[2]99,727,000	29,949,000	96,152,000
April 12	3,603,650	3,630,000	265,160,000	98,654,000	[6]28,381,000	95,471,000
July 5	3,658,200	3,745,000	258,070,000	90,064,000	36,925,000	[6]92,635,000
October 4	3,860,750	4,015,000	246,144,000	[6]80,870,000	49,553,000	96,016,000
October 18	4,110,550	[4]4,120,000	243,605,000	82,584,000	52,403,000	95,800,000
November 15	4,086,850	4,010,000	[6]240,399,000	83,412,000	[2]54,983,000	95,993,000
1942:						
January 3	4,038,000	3,961,000	244,440,000	92,987,000	49,357,000	95,857,000
January 10	4,229,150	3,891,000	244,364,000	94,204,000	47,250,000	94,885,000
January 17	4,045,600	3,723,000	246,267,000	95,617,000	43,984,000	92,703,000
January 24	4,311,300	3,885,000	248,164,000	96,363,000	41,863,000	92,079,000
January 31	3,871,350	3,848,000	250,740,000	97,810,000	40,674,000	91,189,000
February 7	[4]4,336,900	3,853,000	252,366,000	100,224,000	40,038,000	90,859,000
February 14	4,078,500	3,772,000	254,463,000	101,796,000	37,512,000	89,955,000
February 21, 1942	**4,077,350**	**3,889,000**	.....	[1]**104,312,000**	**35,698,000**	**88,899,000**
February 21, 1941	3,629,650	3,568,000	[4]260,948,000	94,706,000	35,325,000	96,883,000
Amount Change:						
From Week Ago	—1,150	+117,000	[8]+2,097,000	+2,516,000	—1,814,000	—1,056,000
From Year Ago	+447,700	+321,000	—6,485,000	+9,606,000	+373,000	—7,984,000
Percent Change From Year Ago	+12.3	+8.9	—2.5	+10.1	+1.1	—8.2

[1] All time peak. [2] Peak for year. [3] Lowest since April, 1922. [4] Stocks, February 15, 1941.
[5] Lowest since October, 1922, due to shut down of six Mid-Continent states. [6] Lowest for year.
[7] Prior to April 29, 1939, data did not include stocks at terminals, in transit, etc., except in California.
[8] Latest weekly change.

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the lower rate of consumption in the corresponding period of 1941. It is impossible to determine, as yet, whether total demand in the last half of 1942 will exceed or fall below the high levels of the same period in 1941.

"Based on present estimates, total gasoline demand may show no increase and may even decrease in 1942 as compared to 1941, while a substantial gain in the total demand for fuel oils may be expected. As yet no change in refinery yield is indicated to meet this situation. There seems to be two alternatives, either to increase the supply of residual fuel oil or to curtail its consumption, and the action taken will have a material effect on the future volume of runs to stills required and on the demand for crude petroleum."

The bureau estimated the total demand for motor fuel in March at 55,600,000 barrels, an increase of 10 percent over the actual demand in that month last year.

It found that stocks of finished and unfinished gasoline amounting to 94,098,000 barrels on December 31 were further augmented by 5,700,000 barrels during January, according to statistics of the American Petroleum Institute, or to approximately 99,800,000 barrels at the close of the month, which was over 9,000,000 barrels more than inventories on January 31, 1941.

"The distribution," it was commented, "indicates that there will be difficulties in supplying the needs in the Atlantic Coast and North Pacific Coast areas. The Indiana-Illinois district may be called upon to supply a greater proportion to the East Coast and Appalachian districts than heretofore."

A further increase of 3,800,000 barrels in finished motor-fuel stocks was estimated by the bureau for March and, with benzol production and direct sales of natural gasoline placed at 1,900,000 barrels, the indicated refinery production would be 57,500,000 barrels, distributed as follows:

District Gasoline Output

East Coast district, 7,580,000 barrels; Appalachian, 2,320,000 barrels; Indiana-Illinois, 11,950,000 barrels; Oklahoma, 2,840,000 barrels; Kansas, 3,200,000 barrels; Inland Texas, 3,670,000 barrels; Texas Gulf Coast, 14,010,000 barrels; Louisiana Gulf Coast, 1,820,000 barrels; Inland Louisiana - Arkansas, 1,180,000 barrels; Rocky Mountain, 1,410,000 barrels; California, 7,520,000 barrels.

Natural gasoline to be blended at refineries was estimated at 6.8 percent of the total refinery production, or 3,910,000 barrels. The yield of straight-run and cracked gasoline was placed at 44 percent, which, applied to the production of 53,590,000 barrels, gives crude runs of 121,800,000 barrels, or 3,929,000 daily. The estimate for foreign crude runs to stills was 3,600,000 barrels; crude for export and to be used as fuel, and losses, were placed at 5,700,000 barrels, making an estimated demand for domestic crude of 123,900,000 barrels for the month, or 3,966,800 barrels a day.

FRED P. SHAYES, geologist for Union Producing Company, Beeville, discussed the geology of Agua Dulce and Stratton fields, Nueces County, at the regular monthly meeting of the South Texas Geological Society held in Corpus Christi February 27.

GRAVITY-SCALE CRUDE OIL PRICES IN MID-CONTINENT FIELDS

Posted in most instances between May 19 and May 21, 1941

GRAVITY	Oklahoma-Kansas: Stanolind, Gulf, Texas, Skelly, Barnsdall, Tidewater, Sinclair, Phillips	Oklahoma-Kansas: Carter, Magnolia, Shell	North Louisiana-Arkansas: [1]Rodessa, etc.	North Louisiana-Arkansas: [2]Champagnolle, etc.	North Louisiana-Arkansas: Bunkie, Eola, Olla, (by Standard)	North Louisiana-Arkansas: Lisbon, La. (by Gulf)	North Louisiana-Arkansas: [3]Atlanta, Buckner, etc., Ark.	Inland Texas and New Mexico: North and West Central Texas	Inland Texas and New Mexico: [4]Eastern Texas	Inland Texas and New Mexico: West Texas, [17]Panhandle, New Mexico	South Texas: [6]Refugio Type	South Texas: [6]Mirando Type	Texas Gulf Coast: [7]Gulf Coast	Texas Gulf Coast: [8]Anahuac Type	Texas Gulf Coast: [9]Dickinson Type	Louisiana Gulf Coast: [10]Gulf Coast	Louisiana Gulf Coast: [11]Standard of La.	Louisiana Gulf Coast: [12]Texas Co.	Louisiana Gulf Coast: [13]Texas Co.	Louisiana Gulf Coast: [14]Magnolia Pet. Co.	Louisiana Gulf Coast: [15]Shell Oil Co.	Louisiana Gulf Coast: Jennings (by Gulf)	[16]Rocky Mt. Area (Salt Creek, etc.)
17-17.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	$0.94	....	....	....
18-18.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	.96	....	....	....
19-19.9	....	....	....	....	....	....	....	....	$0.80	$0.70	$1.08	$1.03	$1.06	$0.98	$0.93	$1.06	....	....	....	.98	$0.99	....	....
20-20.9	$0.85	$0.75	....	....	....	....	$0.68	$0.81	.82	.72	1.10	1.05	1.08	1.00	.95	1.08	$0.90	....	....	1.00	1.01	....	....
21-21.9	.87	.78	....	....	....	....	.70	.83	.84	.74	1.12	1.07	1.10	1.02	.97	1.10	.92	....	....	1.02	1.03	....	....
22-22.9	.89	.81	....	....	....	....	.72	.85	.86	.76	1.14	1.09	1.12	1.04	.99	1.12	.94	....	....	1.05	1.05	....	....
23-23.9	.91	.84	....	....	....	....	.74	.87	.88	.78	1.16	1.11	1.14	1.06	1.01	1.14	.96	....	....	1.08	1.07	....	....
24-24.9	.93	.87	$0.88	$0.86	$0.98	....	.76	.89	.90	.80	1.18	1.13	1.16	1.08	1.03	1.16	.98	....	....	1.11	1.09	....	....
25-25.9	.95	.90	.90	.88	1.00	....	.78	.91	.97 .92	.82	1.20	1.15	1.18	1.10	1.05	1.18	1.00	....	....	1.14	1.11	....	....
26-26.9	.97	.93	.92	.90	1.02	....	.80	.93	.99	.84	1.22	1.17	1.20	1.12	1.07	1.20	1.02	....	....	1.17	1.13	....	....
27-27.9	.99	.96	.94	.92	1.04	$0.81	.82	.95	1.01	.86	1.24	1.19	1.22	1.14	1.09	1.22	1.04	....	....	1.19	1.15	....	....
28-28.9	1.01	.99	.96	.94	1.06	.83	.84	.97	1.03	.88	1.26	1.21	1.24	1.16	1.11	1.24	1.06	$1.06	....	1.21	1.17	....	$0.96
29-29.9	1.03	1.02	.98	.96	1.08	.85	.86	.99	1.05	.90	1.28	1.23	1.26	1.18	1.13	1.26	1.08	1.08	....	1.23	1.19	....	.98
30-30.9	1.05	1.05	1.00	.98	1.10	.87	.88	1.01	1.07	.92	1.30	1.25	1.28	1.20	1.15	1.28	1.10	1.10	$1.05	1.25	1.21	....	1.00
31-31.9	1.07	1.07	1.02	1.00	1.12	.89	.90	1.03	1.09	.94	1.32	1.27	1.30	1.22	1.17	1.30	1.12	1.12	1.07	1.27	1.23	$1.07	1.02
32-32.9	1.09	1.09	1.04	1.02	1.14	.91	.92	1.05	1.11	.96	1.34	1.29	1.32	1.24	1.19	1.32	1.14	1.14	1.09	1.29	1.25	1.09	1.04
33-33.9	1.11	1.11	1.06	1.04	1.16	.93	.94	1.07	1.13	.98	1.36	1.31	1.34	1.26	1.21	1.34	1.16	1.16	1.11	1.31	1.27	1.11	1.06
34-34.9	1.13	1.13	1.08	1.06	1.18	.95	.96	1.09	1.15	1.00	1.38	1.33	1.36	1.28	1.23	1.36	1.18	1.18	1.13	1.33	1.29	1.13	1.08
35-35.9	1.15	1.15	1.10	1.08	1.20	.97	.98	1.11	1.17	1.02	1.40	1.35	1.38	1.30	1.25	1.38	1.20	1.20	1.15	....	....	1.15	1.10
36-36.9	1.17	1.17	1.12	1.10	1.22	....	1.00	1.13	1.19	1.04	1.42	1.37	1.40	1.32	1.27	1.40	1.22	1.22	1.17	....	....	1.17	1.12
37-37.9	1.19	1.19	1.14	1.12	1.24	....	1.02	1.15	1.21	1.06	1.44	1.39	1.42	1.34	1.29	1.42	1.24	....	1.19	....	....	1.19	1.14
37-38.9	1.21	1.21	1.16	1.14	1.26	....	1.04	1.17	1.23	1.08	1.46	1.41	1.44	1.36	1.31	1.44	1.26	....	1.21	....	....	1.21	1.16
39-39.9	1.23	1.23	1.18	1.16	1.28	....	1.06	1.19	1.25	1.10	1.48	1.43	1.46	1.38	1.33	1.46	1.28	....	1.23	....	....	1.23	1.18
40 & Up	1.25	1.25	1.20	1.18	1.30	....	1.08	1.21	1.27	1.12	1.50	1.45	1.48	1.40	1.35	1.48	1.30	....	1.25	....	....	1.25	1.20

[1] Gulf schedule for Caddo, Homer, Haynesville, Bull Bayou, Crichton, De Soto, El Dorado and Rodessa, Texas. Standard of La. schedule for Cotton Valley, Rodessa, Shreveport (Cross Lake), and Caddo. Magnolia schedule for Haynesville, Cotton Valley, Rodessa, and Miller Co., Ark. Texas Co. schedule for "North Louisiana."

[2] Schedule of Standard of La. for De Soto, Sabine, Fouke, Homer, Miller Co., Sugar Creek. Schedule of Root Petroleum Co. for Nick Springs, Urbana light, Schuler sweet, Rainbow, South Field (El Dorado), and Champagnolle.

[3] Schedule of Standard of La. for Atlanta, Buckner, Magnolia, Schuler: Jones sand, Village. Schedule of Root Petroleum Co. for Schuler: Reynolds lime, and Schuler: Jones sand.

[4] Humble schedule for Anderson, Cherokee, Limestone, and Navarro counties and Navarro Crossing field, except that prices from 80 to 92 cents represent postings only for Hawkins field, Wood County. Rodessa, Texas, prices are same as in Rodessa, La.-Ark.

[5] Schedule for Refugio, E. White Point, Greta, Melon Creek, Midway, Minnie Bock, O'Connor-McFaddin, Plymouth, Saxet, Taft, and Tom O'Connor.

[6] Schedule for Blanchard, Bridwell, Colorado, Comitas, Eagle Hill, Escobas, Fitzsimmons, Glen, Government Wells (N. and S.), Heyser, Hoffman, Kelsey, Kohler, Loma Novia, Lundell, Manila, Mirando Valley, Placedo, Randado, Sarnosa, and Tesoro.

[7] Humble schedule for Amelia, Clear Lake, Goose Creek, Hastings, Magnet, Mykawa, Mykawa new, Raccoon Bend, South Thompsons, Sugarland, Thompsons, Webster. Texas Co. schedule for Arriola, Ganado, Hamman, Hillie, Humble, Kubela, Magnet, Manvel, Markham, Mauritz, Old Ocean, Pickett Ridge, Port Neches, Sour Lake, West Columbia, Withers; except that schedule provides $1.36 top, 34 gravity. Pan American Prod. Co. schedule for Hastings and South Houston. Gulf schedule for Spindle Top, Sour Lake, Lovells Lake, West Beaumont, Goose Creek, South Liberty, Big Creek, Blue Ridge, Fannett, Moore, Barbers Hill, Hankamer, Thompsons, Lochridge, Dyersdale, and Hull (old) crudes. Sun schedule for Barbers Hill, Batson old, Cotton Lake, Esperson below 35 gravity, Goose Creek, Greens Lake, Hull below 25, Humble below 35, Nome, North Dayton below 25, Orange, Saratoga, Sour Lake, South Liberty.

[8] Humble schedule for Anahuac, Angleton, Cedar Point, Fishers' Reef, Hull old and new, Pierce Junction, Red Fish Reef, Turtle Bay fields. Sun schedule for Anahuac, Caplen, and Turtle Bay. Gulf schedule for Anahuac, Hull new, Pierce Junction, Orange and Thompsons deep.

[9] Humble schedule for Dickinson, Gillock, Hardin, League City, and Rowan fields. Pan American Prod. Co. schedule for Gillock crude.

[10] Sun Oil Co. schedule for Bayou Blue, Chacahoula, Fausse Pointe, Hackberry (E. and W.), and Vinton. Texas Co. schedule for Bay St. Elaine, Caillou Island, Iberia, Lake Barre, Lake Pelto, Leesville and Port Barre for crudes ranging in gravity up to 27-27.9; for Hahter oils in those fields see Footnote 12. Gulf schedule for Edgerly, Starks, Vinton, E. Hackberry Cameron Meadows, Leesville. Deduct 10 cents for Gulf's prices for Timballer Bay, Grand Bay, Quarantine Bay, and West Bay. Deduct 2 cents for Standard of La. prices for University (Baton Rouge) crude of 30 to 35.9 gravity.

[11] Standard of La. schedule for Bayou Mallet, Choctaw, Darrow, Jeanerette, Lirette, N. Crowley, S. Crowley, Port Barre, Potash, Roanoke, St. Martinville. Deduct 10 cents for Anse La Butte.

[12] Texas Co. schedule for Bateman Lake, Dog Lake, Fausse Point, Horseshoe Bayou, Jefferson Island, Plumb Bob, Vermilion Bay, West Cote Blanche, and Delta Duck Club. Add 8 cents to these prices for Texas Co. postings for 28 or higher gravity at Bay St. Elaine, Caillou Island, Iberia, Lake Pelto, Leesville, Port Barre, and Lake Barre.

[13] Texas Co. schedule for Delta Farms, Golden Meadows, Lake Salvador.

[14] Magnolia schedule for Lockport, Cameron Meadows, West Gueydan.

[15] Shell Oil Co. schedule at Iowa, Black Bayou, White Castle. For Shell's prices at Roanoke and Chalkley fields deduct 5 cents. For Shell's prices at Gibson, South Houma, Hester, and West Lake Verret fields deduct 10 cents.

[16] Sinclair-Wyoming Oil Co. prices at Salt Creek, Lost Soldier, Iron Creek, effective May 20, 1941. Deduct 10 cents for East Mahoney and deduct 20 cents for Mahoney and Wertz.

[17] Add 3 cents for Panhandle prices.

Mid-Continent Flat Prices

FIELD—	Flat Price	Date Posted
Arkansas:		
Big Creek, Dorcheat McKamie	$1.15	5-22-41
Smackover, Heavy	.83	5-22-41
Louisiana, North:		
Cotton Valley Distillate	1.30	5-22-41
Cotton Valley (Holloway Sand)	1.25	5-22-41
Lisbon Distillate	1.20	5-22-41
Louisiana, South:		
Erath	1.21	5-21-41
Garden Island	1.36	5-21-41
Happytown	1.15	5-20-41
Lafitte, Paradis	1.19	5-21-41
Lake Arthur & Tepetate	1.18	5-21-41
Lake Mongoulois	1.36	5-21-41
Ville Platte	1.20	5-21-41
Texas:		
Alice, Benavides (No. Sweden) Ben Bolt Clark-Muil, Sun and Tom Graham	1.35	5-21-41
Cayuga	.90	5-21-41
Clay Creek	1.00	5-22-41
Cleveland	1.26	5-21-41
Conroe	1.43	5-21-41
Darst Creek	1.14	5-21-41
Esperson 35 gravity and above and S. Esperson (Sun Oil Co.)	1.30	5-22-41
East Texas, Flag Lake	1.25	5-20-41
Flour Bluff, East Flour Bluff, and La Rosa	1.33	5-21-41
Hockley-Cochran Counties	.87	5-21-41
Livingston, Cleveland	1.25	5-20-41
Long Lake	1.23	5-21-41
Luling	1.05	5-21-41
Lytton Springs	1.17	5-21-41
North Rincon	1.35	5-22-41
Salt Flat, North Salt Flat, Darst Creek, Hilbig, Carroll, Clark, Zoboroski	1.14	5-21-41
Satsuma, Tomball	1.40	5-21-41
Sun Oil Co. at Batson (new), Fig Ridge, Hardin, Hull 25 and above, Humble 35 and above, LaBelle, North Dayton 25 and above, Oyster Bayou, Seabreeze, South China, West Orange, and Willow Slough	1.25	5-22-41
South Cotton Lake	1.35	5-22-41
Sun	1.35	5-22-41
Talco	.79	5-21-41
Van	1.08	5-21-41
Yates (Deep)	.95	5-20-41
Yates (Shallow)	.82	5-20-41

Michigan Prices

Central (Basin):		
Porter, Greendale, Crystal, Wise, Midland, Vernon, Saginaw	$1.44	5-27-41
Buckeye, Edenville, Bentley, Beaverton, Monitor, Kawkawlin	1.42	5-27-41
Freeman, Lincoln, Sherman Redding, Temple, Winterfield	1.39	5-27-41
Hamilton-Grout	1.29	5-27-41
Adams	1.27	6- 1-41
Arenac, Clayton, Ogemaw, W. Branch	1.24	5-27-41
Southwest (Shallow):		
Traverse crude in Allegan, Kent, Ottawa, Van Buren Cos.	1.45	6- 2-41
Clare	1.11	5-27-41

Middle West Prices

FIELD—	Flat Price	Date Posted
Lima, Ohio	$1.17	5-28-41
Illinois Basin (Sohio Corp.)	1.37	5-19-41
Lake Centralia-Salem, Illinois	1.37	5-19-41
Eastern Ill.-Western Ind.	1.22	5-21-41
Western Kentucky	1.32	5-21-41
Birk City, Western Kentucky	1.32	5-21-41
Kentucky River, Eastern Ky.	1.43	6-19-41
Big Sandy River, Eastern Ky.	1.38	6-19-41

Rocky Mountain States Prices

Colorado:		
Canon City and Florence	$0.95	4- 1-41
Iles	.97	4- 1-41
Montana:		
Cat Creek	1.15	4- 1-41
Cut Bank	1.00	1- 1-40
Dry Creek	1.02	5-20-41
Sunburst	1.00	5-20-41
New Mexico:		
Artesia	.94	5-21-41
Hogback	1.00	10-11-38
Wyoming:		
Big Muddy	1.03	4- 1-41
Byron	.55	10-11-38
Elk Basin	1.00	5-21-41
Frannie, Light	.70	5-20-41
Frannie, Heavy	.47	5-20-41
Garland	.50	10-11-38
Grass Creek, Light	1.00	5- 1-41
Grass Creek, Heavy	.50	5-20-41
Hamilton Dome	.45	5-20-41
Lance Creek (Ohio Oil Co)	1.12	7- 1-41
Mill Creek	.72	10-11-38
Oregon Basin	.40	4-20-40
Osage	1.30	10-11-38
Poison Spider	.59	10-11-38
Rock River	1.15	5-21-41
Tensleep	.6515	2- 1-41

[*Continued on Next Page*]

Wholesale Prices of Refined Products in Principal Markets

REFINED GASOLINE	Current Range (Cents a gal.)		Changes from Month Ago	
Oklahoma Refineries:				
60 Octane and Under	5 1/8	5 3/8	—1/8	...
63-66 Octane	5 1/2	6	—1/8	...
72-74 Octane	5 7/8	6 3/8	—1/8	...
80-82 Octane, Ethyl	6 3/4	7 1/4	...	—1/4
Mid-Western Tank Car:				
60 Octane and Under	5 1/8	5 3/8	—1/8	...
63-66 Octane	5 1/2	6	—1/8	...
72-74 Octane	5 7/8	6 3/8	—1/8	...
80-82 Octane, Ethyl	6 3/4	7 3/8	—3/8	...
New York Harbor:				
68-70 Octane	8 3/8	8 3/8	...	...
72-74 Octane	8 3/4	8 7/8	...	+1/2
Min. 80 Octane, '39 Research	8 7/8	9 3/8	+3/8	...
Gulf Coast:				
60 Octane unleaded	5 5/8	5 5/8	...	...
65 Octane unleaded	5 3/4	5 7/8	—1/8	...
68 Octane unleaded	5 7/8	6 1/4	—3/8	...
70 Octane unleaded	5 7/8	6 1/2	—3/8	...
72-74 Octane leaded	6	6 1/4	—1/8	—1/8
Min. 80 Octane, '39 Research	6 1/4	6 1/2	...	...
NATURAL GASOLINE				
Grade 26-70:				
F.O.B. Group 3	2 3/8	2 3/8	—2 1/8	—2 1/8
F.O.B. Br'kenr'ge, Texas	2	2	—2	—2
KEROSENE				
Oklahoma Refineries:				
41-43 water white	4 3/8	4 3/8	...	...
42-44 water white	4 1/2	4 5/8	...	—1/4
Mid-Western Tank Car:				
41-43 water white	4 3/8	4 3/8	...	...
42-44 water white	4 1/2	4 1/2	...	—3/8
New York Harbor	5 3/8	5 3/8	...	...
Gulf Coast:				
41-43 water white	4	4 3/8	—1/4	...
RANGE OIL				
At Oklahoma Refineries	4	4 3/8	...	...
In Mid-Western Market Group 3, basis	4	4	...	—1/4
LIGHT FUEL OILS				
Oklahoma Refineries:				
No. 1 prime white	3 7/8	4 1/4	...	...
No. 1 straw	3 1/2	4	...	...
No. 2 straw	3 5/8	4 1/8	...	...
No. 3	3 1/2	3 1/2	...	...
Mid-Western Tank Car:				
No. 1 prime white	3 7/8	4 1/4	...	...
No. 2 straw	3 5/8	3 7/8	...	+1/8
No. 3	3 1/2	3 5/8	...	—1/8
New York Harbor:				
No. 1	5 3/8	5 3/8	...	...
No. 2	5 1/4	5 1/4	...	...
No. 3	5 1/4	5 1/4	...	...
Gulf Coast:				
No. 2	3 7/8	4	—1/8	...

HEAVY FUELS	Current Range (Per Bbl.)		Changes from Month Ago	
Oklahoma Refineries:				
No. 6	$0.85	$0.90	—.05	...
14-16 Gravity	.95	.95	...	...
Mid-Western Tank Car:				
No. 6	.85	.85	...	—.02 1/2
No. 5	.85	.85	...	...
New York Harbor:				
No. 5	1.65	1.80	...	...
No. 6	1.35	1.35	...	...
BUNKER C FUEL OIL (Per barrel, ships' bunkers)				
Gulf Coast	$0.85	$0.95	...	...
New York Harbor	1.35	1.35	...	...
DIESEL OIL (Per barrel, ships' bunkers)				
Gulf Coast	$1.65	$1.80	...	...
New York Harbor	2.15	2.15	...	...
LUBRICATING OIL (Cents a gal.)				
Oklahoma Refineries:				
Bright stock (viscosity at 210°):				
200 vis. D, 10-25 pour point	.27	27	...	...
150-160 vis. D:				
0-10 pour point	23	23 1/2	...	...
10-25 pour point	22 1/2	23	...	...
25-40 pour point	23	23	...	...
150-160 vis. E	22	22	...	—1/2
120 vis. D, 0-10 pour point	22	22	...	—1/2
600 s.r. dark green	9 1/2	9 1/2	+1/2	...
600 s.r. olive green	10 1/2	11	+1/2	...
631 s.r.	18 1/2	18 1/2	...	...
Neutral Oils (viscosity at 100°, 0-10 pour point):				
Pale Oils:				
60-85 vis. No. 2 color 8		8 1/2	...	...
86-110 vis. No. 2 color 8 1/2		8 3/4	...	...
150 vis. No. 3 color	14 1/2	14 1/2	...	...
180 vis. No. 3 color	15	15	...	...
200 vis. No. 3 color	15	15 1/2	...	...
250 vis. No. 3 color	16 1/2	16 1/2	...	...
280 vis. No. 3 color	17	17 1/2	...	...
300 vis. No. 3 color	18	18 1/2	...	...
Red Oils:				
180 vis. No. 5 color	15	15	...	...
200 vis. No. 5 color	15	15	...	—1/2
280 vis. No. 5 color	17 1/2	17 1/2	...	...
300 vis. No. 5 color	17 1/2	17 1/2	...	—1
Western Pennsylvania:				
Cylinder Stocks:				
600 s.r. filtrable	15	15	...	—1
650 s.r.	15 1/2	15 1/2	...	—1
600 flash	16	16	...	—1
630 flash	17	17	...	—1/2

LUBRICATING OIL (Cents a gal.)			Changes from Month Ago	
Bright Stock (No. 8 Color, 145-155 vis. at 210°, 540-550 fl.):				
10 pour test	30 1/2	30 1/2	...	...
15 pour test	29 1/2	29 1/2	...	...
25 pour test	25	25	...	...
Viscous Neutrals (No. 8 Color, vis. at 70°):				
200 (180 at 100), 420-425 fl.:				
Zero pour test	40 1/2	40 1/2	...	...
10 pour test	39 1/2	39 1/2	...	...
15 pour test	38 1/2	38 1/2	...	...
25 pour test	33	33	...	...
150 (143 at 100), 400-405 fl.:				
Zero pour test	38 1/2	38 1/2	...	...
10 pour test	37 1/2	37 1/2	...	...
15 pour test	36 1/2	36 1/2	...	...
25 pour test	31	31	...	...

Eastern States Crude Oil Prices

FIELD—	Flat Price	Date Posted
Bradford-Allegany	$2.75	8-25-41
Sw. Pa. Pipe Line	2.40	8-25-41
Eureka Pipe Line, W. Va.	2.34	8-25-41
Corning Grade, Ohio	1.31	5-27-41
Buckeye Crude, Ohio	2.30	6-18-41

Major Crude Oil Price Changes

	Penna. Grade	Mid-Cont. (36 Gr.)	Calif. (26 Gr.)
Jan. 1, 1940	Up 25	.....	.....
Feb. 1, 1940	.....	.....	Cut *7
May 22, 1940	Cut 25	.....	.....
June 18, 1940	Cut 25	.....	.....
July 12, 1940	Cut 25	.....	.....
Aug. 28, 1940	Cut 15	.....	.....
Nov. 12, 1940	Up 15	.....	.....
Dec. 17, 1940	Up 15	.....	.....
Jan. 27, 1941	Up 15	.....	.....
April 1, 1941	.....	Up 5	.....
April 23, 1941	Up 10	.....	.....
April 24, 1941	.....	.....	Up *6
May 19, 1941	.....	Up 10	.....
May 21, 1941	Up 15	.....	.....
May 22, 1941	.....	.....	Up *6
June 18, 1941	Up 20	.....	.....
Aug. 14, 1941	Up 23	.....	.....
Aug. 25, 1941	Cut 23	.....	.....

*Signal Hill 26 gravity.

CRUDE OIL PRICES IN CALIFORNIA

Prices per barrel in field, posted by Standard Oil Company of California, effective May 23, 1941
All gravities above those quoted take highest price offered in that field

Gravity	Signal Hill (Long Beach)	Wilmington	El Segundo	Seal Beach	Huntington Beach	Inglewood	Playa del Rey	Olinda, Brea Canon	Athens-Rosecrans	Torrance	Richfield	Whittier East Coyote (La Habra)	Montebello	West Coyote Hills	Santa Fe Springs	Newhall, Kern River, Kern Front, McKittrick, Round Mountain	Greeley, Canal, Wasco	Coles Levee	Mountain View	Elk Hills, Buena Vista Hills, Midway-Sunset, Lakeview Area	Lost Hills	Coalinga	Kettleman Hills	Elwood Terrace
14-14.9	....	$0.68	....	....	$0.71	....	....	$0.70	....	$0.70	$0.70	$0.70	$0.72	....	....	$0.73	....	....	....	$0.73	$0.73	$0.73	....	....
15-15.9	....	.71	....	....	.75	$0.76	....	.72	....	.72	.71	.72	.72	....	....		....	....	....	.73	.73	.73	....	....
16-16.9	....	.74	$0.79	....	.79	.79	....	.75	....	.74	.73	.75	.72	....	....		....	....	....	.73	.75	.73	....	....
17-17.9	....	.78	.82	....	.82	.82	....	.78	....	.77	.76	.78	.72	....	....		....	....	....	.75	.78	.73	....	....
18-18.9	$0.80	.82	.86	....	.86	.85	....	.81	....	.80	.79	.82	.74	....	....		....	....	....	.78	.81	.73	....	....
19-19.9	.84	.86	.90	....	.89	.88	....	.85	....	.83	.82	.85	.77	....	....	Wheeler Ridge	....	....	$0.73	.81	.84	.75	....	....
20-20.9	.88	.90	.94	....	.93	.92	$0.80	.88	....	.86	.85	.89	.80	....	....		....	....	.76	.85	.87	.77	....	....
21-21.9	.92	.94	.98	....	.96	.95	.84	.91	....	.89	.89	.92	.84	....	....		....	....	.79	.90	.90	.80	....	....
22-22.9	.96	.98	1.02	$0.88	.99	.98	.87	.95	....	.93	.93	.96	.87	....	....	$0.76	....	....	.83	.94	.93	.83	....	....
23-23.9	1.00	1.02	1.05	.92	1.02	1.01	....	.98	....	.97	.98	1.00	.91	....	....	.80	....	....	.87	.99	.96	.86	....	....
24-24.9	1.03	1.06	1.07	.97	1.05	1.04	F.O.B.	1.01	....	1.01	1.02	1.03	.94	$0.99	....	.83	....	....	.90	1.03	.99	.89	....	....
25-25.9	1.07	1.09	1.10	1.01	1.08	1.07	Our	1.04	....	1.05	1.06	1.07	.98	1.02	....		....	....	.94	1.07	1.01	.92	....	....
26-26.9	1.11	1.12	1.12	1.06	1.11	1.10	Pipe	1.08	....	1.09	1.10	1.11	1.01	1.06	....	....	....	....	.97	1.11	1.04	.95	....	....
27-27.9	1.15	1.15	1.15	1.10	1.14	1.14	Line	1.11	....	1.13	....	1.15	1.05	1.10	$1.04	....	....	....	1.01	1.15	1.07	.98	....	....
28-28.9	1.18	1.18	1.17	1.15	1.17	1.17	....	1.14	....	1.17	....	....	1.08	1.13	1.08	....	....	....	1.04	1.19	1.10	1.00	....	....
29-29.9	1.20	1.21	....	1.19	1.20	1.20	....	....	$1.17	....	....	....	1.12	1.17	1.12	....	....	....	1.07	1.24	1.13	1.02	....	....
30-30.9	1.23	1.24	....	....	1.23	1.22	....	....	1.21	....	....	....	1.15	1.21	1.15	....	$1.01	$1.09	1.10	1.28	1.16	1.04	....	F.O.B.
31-31.9	....	....	....	....	....	1.24	....	....	1.25	....	....	....	1.19	1.24	1.19	....	1.04	1.12	1.14	....	....	1.06	....	Ship
32-32.9	....	....	....	....	....	....	....	....	1.29	....	....	....	1.23	1.28	1.23	....	1.07	1.14	1.17	....	....	1.09	....	....
33-33.9	....	....	....	....	....	....	....	....	1.32	....	....	....	1.27	....	1.26	....	1.10	1.17	....	....	....	1.11	....	$1.22
34-34.9	....	....	....	....	....	....	....	....	1.36	....	....	....	1.31	....	1.30	....	1.13	1.20	....	....	....	1.13	....	1.25
35-35.9	....	....	....	....	....	....	....	....	....	....	....	....	1.35	....	....	....	1.16	1.22	....	....	....	....	$1.23	1.28
36-36.9	....	....	....	....	....	....	....	....	....	....	....	....	1.39	....	....	....	1.19	1.25	....	....	....	....	1.26	....
37-37.9	....	....	....	....	....	....	....	....	....	....	....	....	1.43	....	....	....	1.22	....	....	....	....	....	1.29	....
38-38.9	....	....	....	....	....	....	....	....	....	....	....	....	1.47	....	....	....	1.25	....	....	....	....	....	....	....
39-39.9	....	....	....	....	....	....	....	....	....	....	....	....	1.51	....	....	....	....	....	....	....	....	....	....	....
40-40.9	....	....	....	....	....	....	....	....	....	....	....	....	1.53	....	....	....	....	....	....	....	....	....	....	....

U. S. Field Operations

Illinois

Clay County Discovery Waiting for Pipe Line

Completion of pool opener in Clay County awaiting pipe line; two White County pool openers still testing; Edwards County wildcat shows for producer but will be drilled deeper; muddy roads hold up activity at many tests; 21 first reports for week.

Clay County: Cameron Oil Co.'s Landwehr 1, NW NW NE 8-5n-7e, north of Bible Grove, is idle pending completion of 12½-mile pipe line by Central Pipe Line Co. It had McClosky at 2810-17 ft which indicated flowing well on drill stem test.

White County: Minerva Oil Co.'s Ramsey 1, C N½ SW NE 33-6s-10e, 3½ miles southeast Storms field, swabbed 8 bbls hr from Aux Vases at 2904-15 after 15-quart shot. Carter Oil Co.'s Marlin 1, SW NW 35-6s-9e, a mile and a half south of the Storms field, plugged back to 2810 in Bethel to shut out water; before plugback well pumped 137 bbls of oil and 20 bbls of water in 24 hours.

Edwards County: Ike Taylor's Olde 1, C S½ SE SW 30-1s-11e, swabbed 7 bbls fluid, 10 percent water, in 8 hours, from Aux Vases at 3055-74 after a shot; will go deeper.

COMPLETIONS

Clay County: Wildcat — Ill. Prod Corp.'s Kneff 1, c n½ ne ne 15-2n-7e, abnd 3132 ft.

Fayette County—Magnolia's Clow 41, c n½ of sec 5-7n-3e, Weil 1440-65 ft, Beth 1500-59 ft, 15 bbls, 3200 ft. Carter's Birdie 5-D, c e½ nw se 29-8n-3e, Dev 3034-38 ft, td 3038 ft, 45 bbls.

Gallatin County—Buell & Herndon's Egy, T&T 5, ne sw se 16-8s-10e, Weil 2419-31 ft, 8 bbls, 2435 ft.

Hamilton County—Kewanee-Shell's Culvar 1, c e½ se sw 14-6s-5e, A.V. 3082-88 ft, 3102-08 ft, 141 bbls oil, td 3345 ft. Ohio's Smith 1, nw se nw 24-6s-5e, A.V. 3088-3111 ft, 110 bbls, 3263 ft. Carter's Johnson 3, nw sw se 12-6s-6e, A.V. 3055-71 ft, 346 bbls, 3071 ft.

Jackson County: Wildcat — Glenwood Oil's Truex-Traer 2, se se ne 24-7s-2w, abnd 2200 ft.

Jasper County—C. R. Craft's Reis 1, e½ se ne 6-5n-14w, McC 2836-42 ft, 2845-48 ft, 240 bbls, 2850 ft. Pure's Kasserman 1, e½ se sw 19-5n-10e, McC 2860-87 ft, 149 bbls, 2887 ft.

Richland County: Wildcat—J. B. Bushnell's Newland 1, s½ se ne 4-4n-4w, abnd 535 ft.

Wayne County—Wiser Oil's Watson 9, c e½ nw ne 34-1n-6e, A.V. 2944-52 ft, 125 bbls, 2952 ft. Shell's Weaver 1, s½ ne ne nw 1-1s-6e, A.V. 3070-97 ft, L. O'H 3149-3164 ft, 311 bbls, 3268 ft; Shell's Weaver B-1, s½ nw nw ne 1-1s-6e, A.V. 3072-92 ft, Rosi 3152-54 ft, 3164-68 ft, 330 bbls, 3270 ft. Texas' Gregg 1, e½ sw ne 28-1s-6e, A.V. 3033-61 ft, McC 3166-85 ft, 306 bbls, 3195 ft. Kingwood's O'Neil 1, s½ se se 17-1s-6e, A.V. 3029-50 ft, 26 bbls, 3241 ft. R. S. Hayes' Towns 1, c e½ se ne 18-1n-7e, abnd 3290 ft.

White County—Superior's Ford 21, nw se se 5-5s-14w, A.V. 2850-75 ft, Weil 2586-2600 ft, 30 bbls, 2875 ft. J. Dawson et al's Clark 1, nw sw ne 36-5s-10e, McC 3003-07 ft, 3081-85 ft, 3048-52 ft, 23 bbls, 3154 ft. N. V. Duncan et al's Powell 1, nw nw se 1-7s-8e, A.V. 2913-34 ft, 2 to 4 bbls, 2943 ft.

OLD WELLS DEEPENED

Fayette County—Carter's Durbin 15, ne sw se 5-7n-3e, Weil 1486-1506 ft, Stray 1548-73 ft, Beth 1584-92 ft, otd 1585 ft, td 1592 ft, 115 bbls.

Marion County—Ohio's Young 17, se se nw 20-2n-2e, Tren 4512-4618 ft, otd 3426 ft, td 4626 ft, 96 bbls; Young 37, se se sw 20-2n-2e, Trenton 4504-4618 ft, otd 3430 ft, td 4620 ft, 64 bbls. I. D. Lain's Dempsey 11, e½ ne ne sw 31-2n-2e, Trenton 4492-4619 ft, otd 3385 ft, td 4619 ft, 74 bbls.

WILDCAT STARTS

Bond County—W. C. McBride's Jacobs 1, 57 ft n of se sw nw 31-4n-2w, lcn.

Clay County—Sinclair's Stanley 1, w½ nw ne 8-4n-8e, lcn.

Franklin County—I. W. Taylor's Old Ben Coal Co. 1, s½ sw se 18-5s-2e, lcn. Seaboard's U. S. Coal & Coke Co. 1, c sw se 14-6s-4e, lcn.

Jasper County—Pure's Ben Ocks 1, w½ ne ne 35-6n-10e, lcn.

Jefferson County—Kingwood's J. F. P. Co. 1, ne ne sw 29-3s-2e, lcn.

Perry County—Shell's Schubert 1, se nw sw se 23-4s-2w, dr.

Wayne County—Bell Bros.' Hand 1, e½ sw nw 11-3s-5e, lcn.

White County—Sun Oil Co.'s Hertlein 1, s½ se nw 13-4s-9e, lcn. Seaboard's Doerr 1, sw nw sw 3-5s-9e, lcn.

Indiana

Posey County Wildcat Flows 20 Barrels Hour

Sinclair-Wyoming Oil Co.'s D. G. Nash 1, SW SW NE 32-7s-14w, Posey County wildcat 5 miles south and 5 miles west of Mt. Vernon field, flowed 40 bbls in initial 2 hours from Lower O'Hara at 2739-42 ft before it was shut in for storage. Hole was bottomed at 2913 ft, elevation 366 ft, Menard 1934; Glen Dean 2180; Aux Vases 2712-33 ft; St. Genevieve 2734; St. Louis 2878 ft.

Vanderburgh County: Sells Petroleum Co.'s McCarty 1, NE SW NW 32-6s-11w, two miles southwest of Evansville, pumped 7 bbls hour in initial 13-hour test, from Waltersburg sand, 1718-1736 feet.

Gibson County: Roy Benoist's Dunn 1, C W½ SE SW 24-1n-10w, in the Hazleton area, initialed 96 bbls oil and 10 bbls of water in 24 hours on pump from McClosky, 1744-47 and 1770-76 ft.

COMPLETIONS

Crawford County: Wildcat—Lankford Bros. et al's Esarey 1, ne nw ne 36-3s-1w, abnd 1200 ft.

Daviess County—Idillky Oil Co.'s Wallace 3, ne ne sw sw 21-2n-7w, Sand 923-28 ft, 8 bbls, 955 ft.

Posey County — W. C. McBride, Inc.'s Swonder 11, nw se se 4-4s-14w, A.V. 2808-33 ft, 50 bbls, 2833 ft. Jack German's Allyn 1, se ne se 24-6s-13w, abnd 2473 ft.

Spencer County—Ky. Nat. Gas' Yeager 3, se nw ne 31-7s-6w, Pales, 917-921 ft, 8 bbls, 930 ft.

Sullivan County—Sun Oil Co.'s Queen 1, c e½ se nw 17-6n-9w, abnd 2700 ft. Walter Wyman's Fee 1, n½ sw se 25-9n-10w, sand 495-521 ft, td 521 ft, .075 gas.

OLD WELL DEEPENED

Gibson County—R. D. Brown, Inc.'s Crecelius 1, ne sw se 36-1s-10w, Hard'b 1316-25 ft, 32-40 ft, otd 1326 ft, td 1340 ft, 20 bbls.

WILDCAT STARTS

Posey County—Carter's Baker 1, c sw nw 9-7s-14w, lcn.

Vanderburg County — H. K. Riddle's Jacquemal et al's 1, c s½ ne se 15-5s-11w, lcn.

Kentucky

COMPLETIONS

Daviess County — Randall & Mohrburger's Hansford 2, 16-N-29, abnd 1718 ft. Globe O&G et al's Clark 12, 18-N-29, abnd 1174 ft. J. C. Miller's Westerfield 1 (2), 17-N-31, abnd 1124 ft.

Hancock County—McDonough & Co.'s Voyles 1, 3-O-33, abnd 741 ft. McDonough & Co.'s Voyles 2, 3-O-33, abnd 478 ft.

Hopkins County: Wildcat—Henry Myers' Ky. Store & Land 1, 16-H-24, abnd 1768 ft.

WILDCAT START

Henderson County—Carter's Toy 1, 21-P-24, lcn.

Oklahoma

Pottawatomie County Well Makes 463 Barrels

New producer added Hotulke area; casing set for test of east flank of Apache field; new pool in prospect for Okfuskee County; Cleveland County wildcat has slight oil show.

Pottawatomie County: Midstates Oil Corp.'s Nedeau 2, C NE NE 25-9n-4e, topped Hunton lime 4088 ft, drilled to 4110 ft, perforated, acidized, flowed 463 bbls in 24 hrs; still testing.

Caddo County: Texas Co.'s Mulkahay 3, SW NE SE 2-5n-12w, drilled to

Summary of Drilling Operations in the United States, Week Ended February 28, 1942

	WELLS COMPLETED						
	Completions	Oil Wells	Gas Wells	Failures	†Miscellaneous	Total 1942	Total this Date 1941
Alabama	....	....	....	....	....	2	....
Arkansas	1	....	....	1	....	19	25
California	20	15	1	4	....	179	198
Colorado	....	....	....	....	....	2	2
Georgia	....	....	....	....	....	1	....
Illinois	24	16	....	4	4	509	485
Indiana	8	3	1	3	1	74	77
Kansas	23	13	....	10	....	335	320
Kentucky	6	....	....	6	....	39	48
Louisiana	25	19	....	5	1	207	239
Michigan	17	8	....	8	1	144	131
Mississippi	4	3	....	1	....	34	24
Missouri	....	....	....	....	....	2	12
Montana	1	1	....	....	....	29	41
Nebraska	....	....	....	....	....	8	20
New Mexico	10	9	....	1	....	69	54
New York	21	10	....	....	11	234	107
Ohio	23	3	9	11	....	272	268
Oklahoma	31	17	1	10	3	351	321
Pennsylvania	49	42	6	....	1	466	577
Tennessee	....	....	....	....	....	1	5
Texas	117	72	5	33	7	1,479	1,457
West Virginia	16	3	12	1	....	142	133
Wyoming	1	....	....	1	....	13	18
Total this week	397	234	35	99	29	4,611	4,562
Total last week	449	214	54	108	73	4,214	3,997
Total this year	4,611	2,695	389	1,063	464	....	....

† Includes old wells deepened, water intake, gas input, and salt water disposal wells.

3664 ft in Wilcox sand, set casing and is waiting for a test. Originally drilled to 3530 ft, encountered faulted zone, plugged back and diverted hole to west; to southeast operator's Mulkahay 6, still shut down at 3834 ft, no Wilcox sand reported.

Okfuskee County: Doak & Hughes et al's Hensley I, NW SE NW 21-13n-9e, near Beidleman pool, may open new Dutcher sand pool; cored 3182-90 ft earlier, recovered 8-ft saturated core, after standardizing and drilling 8 ft more, swabbed 35 bbls oil on preliminary 8-hr test with indications oil flow increasing; testing.

Cleveland County: Phillips Petroleum Co.'s Heenan I, SE NE SE 6-8n-1e, southeast of Norman, cored 6065-75 ft in Hunton lime topped 6020 ft, slight show heavy, black oil, taking drill stem test.

COMPLETIONS

Barton County—Texas Co.'s Cook 1, c e½ nw sw 21-16s-13w, td 3447 ft, Lansing 3252 ft, 6 bbls.

Comanche County: Wildcat — Texas Co.'s Reich 1, c nw nw ne 25-4n-11w, green shale 1240 ft, sd zone 1310 ft, soft sd 1319 ft, cored 1322-32 ft, 4 ft sd oil odor, Tulip zone 1747 ft, sd 1873 ft, blew out 1912 ft, McLish 2035 ft, sd 2207 ft, cored 2213-23 ft, rec 4 ft fine grain tight sand with stain, td 3493 ft, pb 2485 ft, filled 50 ft, fluid, swb to bottom, fresh water stain of oil, abnd.

Garfield County: Garber—Champlin's Haze B-1, nw ne sw 30-23n-3w, td 5069 ft, 6.0 gas.

Garvin County: Tussy — W. A. Delaney's Bates 1, sw sw sw 29-1n-3w, sand 3321-60 ft, td 3390 ft, pump 100 bbls oil and 100 bbls water.

Jefferson County: Oscar — Sietz-Comegys-Sietz' Brown 1, ne ne ne 23-6s-6w, sand 2242-47 ft, abnd 2247 ft.

Kay County: Mervine—McClung's Murdock 2, c nw sw 2-27n-3e, sand 1006-11 ft, abnd 1032 ft.

Kay County: Dilworth—West Virginia Oil's Fox 7, se sw ne 19-28n-1e, Wilcox 3356 ft, td 3370 ft, pump 25 bbls.

Kay County: Tonkawa—Ingling & Parker's School Land 1, 50 ft w of c sw ne 36-25n-1w, sand 2050 ft, td 2532 ft, pb 2050 ft, flow 68 bbls.

Kay County: Wildcat—Helmerich & Payne's Kregor 1-A, se se ne 4-25n-2w, pb 3800 ft, Miss 4564 ft, dd to test Wx, abnd.

Lincoln County: Chandler — Jones et al's Lockhart 1, sw nw se 17-14n-4e, 2nd Wilcox 5107 ft, abnd 5125 ft.

Lincoln County: Wildcat—Fred Haddock et al's Hert 1, sw ne se 22-17n-3e, Skinner 3935 ft, cored 3938-53 ft, rec 2½ ft sat sand, 2 ft dark gray shale, 5 ft 6 in sandy shale with odor gas, cored 4006-24 ft, rec 5 ft grn to buff porous soft sand, good gas odor, salty, base Bartles 4071 ft, Miss lime 4227 ft, Wood 4335 ft, Hunton 4375 ft, Sylv 4340 ft, Vl 4475 ft, Dense 4507 ft, Wx 4538 ft, set casing 4547 ft, drld plug, 2500 gas, perf 53/4530-40 ft, acidized 2000 gals, open 2 hrs, flow 15 bbls per hr, flow 35 bbls oil through tubing 2.5 gas, 1700 lbs rp.

Logan County: Wildcat — Cities Service's Babcock 1, se ne ne 10-15n-4w, Layton sand 5010-45 ft, td 6800 ft, pb 5115 ft, flow 1182 bbls.

Logan County: Guthrie — McBride's Eastwood 7, ne nw sw 7-17n-1w, Bartlesville 5070 ft, td 5095 ft, shot 67 qts, flow 450 bbls.

Oklahoma County: Oklahoma City — Big Chief's Hamilton 2, ne c sw sw 22-12n-3w, Wilcox 6466 ft, td 6542 ft, shot 180 qts, pump 388 bbls, Barnsdall's Brach 7, ne se nw sw 23-12n-3w, Wilcox 6420 ft, td 6603 ft, shot 323 qts, pump 76 bbls oil.

Okmulgee County: Hamilton Switch—Deaner et al's Sunbeam 1, ne nw sw nw 36-14n-12e, Dutcher 2002-07 ft, td 2007 ft, pb 2004 ft, abnd.

Okmulgee County: Bald Hill—Link's Buchanon 11, ne c sw nw 6-14n-14e, Glenn 1681 ft, pay 1681-97 ft, pay 1699-1710 ft, td 1713 ft, pb 1711 ft, pump 5 bbls oil and 5 bbls water, A. I. Hazlett's Ashley 12, nw c se nw 29-14n-14e, Booch 1253-69 ft, td 1269 ft, shot 60 qts, pump 10 bbls.

Okmulgee County: Pollyanna — Reliance Oil's Cowan 11, c s½ se ne sw 26-16n-11e, Glenn 1992 ft, td 2312 ft, pb 2311 ft, pump 45 bbls.

Osage County: East Hominy — Marshall Strozier's 2, se sw se 21-22n-9e, Arb 2730 ft, abnd 2785 ft, dry.

Osage County: Wildcat—Dunn & Miller's 1, ne nw nw 17-24n-8e, Redford 2348 ft, abnd 2887 ft.

Payne County: Coyle—Blackwell & Helmerich-Payne's Collins 4, s½ sw nw 13-17n-1e, Hunton 4597 ft, td 4885 ft, perf casing, 500 gals acid, flow 315 bbls oil 40 bbls water.

Payne County: Cushing—L. B. Jackson's Minnich 1, ne se ne 3-18n-6e, sand 3240 ft, td, flow 100 bbls.

Pottawatomie County: South Konawa — Farmers Mutual's Waite 2, se nw se 9-5n-5e, Viola 2618 ft, abnd 2658 ft.

Pottawatomie County: St. Louis—Kosmos' Milborn 2, sw ne nw 15-7n-4e, Dolomite 4202 ft, td 4252 ft, 6500 gals acid, pump 200 bbls.

Pottawatomie County: North Beggs—Standard et al's McIntosh 1A, ne c nw nw 17-15n-12e, Wilcox 2657-62 ft, abnd 2662 ft.

Stephens County: Woolsey—Mid-Continent's Baker 1, nw se ne 35-2s-6w, lime 1760-65 ft, td 1830 ft, flow 203 bbls.

Stephens County: West Loco—L. W. Winkler et al's Peck 2, ne nw ne 1-3s-6w, Hoxbar 1192-98 ft, Hoxbar 1225-44 ft, Hoxbar 1675-90 ft, td 1868 ft, perf, pump 25 bbls.

OLD WELLS DEEPENED

Creek County: Glenn—Gulf's Berryhill 3, ne nw nw ne 17-17n-12e, otd 1593 ft, Glenn 1525 ft, shot 130 qts, pump 15 bbls.

Okfuskee County: Olympic—Sinclair Prairie's Palmer 6, ne ne nw 19-10n-9e, otd 1817 ft, sand 1816 ft, td 1869 ft, shot 20 qts, pump 22 bbls oil and 27 bbls water.

Pontotoc County: Wildcat — Elm Oil's Sweeney 1, se se ne 23-4n-5e, Cromwell 1350 ft, Caney 1448 ft, otd 1650 ft, abnd 2865 ft.

WILDCAT STARTS

Lincoln County—Magnolia's Bouse 1 ,c nw ne 23-14n-4e, dr. Mid-Continent's Walker 1, se sw sw 13-14n-6e, dr.

Logan County—Fain & Continental et al's Ferguson 1, sw sw se 27-17n-4w, lcn.

Okfuskee County—K. G. G. F. et al's Engelsman 1, nw ne nw 30-11n-10e, dr.

Okmulgee County—Keenan et al's Fewell 1, sw sw sw 25-15n-11e, lcn.

Osage County—Olson Drlg. Co.'s Osage 1, sw sw sw 12-24n-5e, dr. Norbla et al's Osage 1, nw nw se 6-24n-6e, dr.

Seminole County — Simpson-Fell's Replogle 1, ne ne nw 34-10n-8e, owdd, otd 2300 ft, dr.

Kansas

New Arbuckle Lime Pool in Ellsworth

New Arbuckle lime pool opened in Ellsworth County; Barber County wildcat to plug back for Mississippi lime test after failing in Simpson; Smyers pool definition looms.

Ellsworth County: Nate Appleman et al's Stratman 1, C NL NW NW 14-17s-10w, opens new Arbuckle lime field, designated North Heiken area. Drilled to 3228 ft in lime topped at 3218 ft, produced 231 bbls oil in 24 hrs; may acidize later.

Barber County: Champlin Refining Co.'s Hildebrand 1, C EL NE NW 26-32s-15w, 11 mi southwest Sun City pool, failed in Simpson series; cementing back to perforate in Mississippi lime topped at 4740 ft.

Rice County: Continental Oil Co.'s John 1, SE NW 36-19s-6w, north offset to discovery well in Smyers pool, drilled out cement plug in chat at 3329 ft and was testing with very little oil showing, may prove northern boundaries of small pool.

COMPLETIONS

Butler County: Wildcat—Ash & Plymate's Hannabaum 1, ne sw se 15-24s-4e, Lansing 1835 ft, Miss 2488 ft, abnd 2603 ft.

Davidson County—H. H. Blair's Peirano B1, c n½ nw nw 3-16s-11w, Lansing 2970 ft, 5000 gals acid, pump 618 bbls, 2062 ft.

Davidson County: Prusa — Texon et al's Esfeld 1, c e½ se sw 20-16s-11w, Arb 3298 ft, td 3306 ft, potential 3000 bbls.

Davidson County: Wildcat—C. E. Ash & Crown's Roth 1, c n½ ne ne 25-19s-11w, Arb 3316 ft, td 3334 ft, shot 20 qts, 2500 gals acid, pump 343 bbls.

Davidson County: West Silica — Herndon Drlg.'s Hagen 2, se nw sw 20-20s-11w, Arb 3314 ft, td 3335 ft, 1000 gals acid, pump 338 bbls.

Cowley County: Couch — Helmerich & Payne's Marlow 1, nw ne ne 24-30s-5e, Bartlesville 2796 ft, abnd 2832 ft.

Cowley County: Frog Hollow—Leader & Zephyr's Elliot 2, sw ne se 17-32s-5e, Bartlesv 3005 ft, td 3031 ft, shot 30 qts, flow 638 bbls.

Ellis County: Burnett — Virginia Drlg.'s Feldkamp 1, c s½ ne nw 11-11s-18w, Arb 3475 ft, td 3477 ft, potential 2955 bbls.

Ellis County: Walter—Stanolind's Baker 1, c e½ ne se 10-12s-18w, Arbuckle 3831 ft, abnd 3865 ft.

Graham County: Wildcat—Cities Service's Newell 1, sw sw se 21-8s-21w, Anhy 1640 ft, Topeka 3063 ft, Lansing 3334 ft, Base KC 3545 ft, Arb 3655 ft, satur 3663-67 ft, 23 holes 3679½-84 ft, water in hole, abnd.

Leavenworth County: Wildcat—McLaughlin's Miller 1, c ne se 22-10s-20e, Leavenworth 122 ft, Lansing 414 ft, Base Hertha 752 ft, Silt Stone 1415 ft, Bartlesv 1437-56 ft, Miss 1476 ft, hole full water, Hunton 1872 ft, abnd 1947 ft.

McPherson County: Henne — H. M. Drlg.'s Anderson 2, c e½ ne nw 21-17s-1w, Miss lime 2648 ft, pay 2657-2663 ft, td 2684 ft, 5000 gals acid, pump 54 bbls oil 65 bbls water.

Pratt County: Cunningham—S. A. Springer's Sitton 3, c s½ se nw 35-27s-11w, Lansing 3474 ft, td 3550 ft, 5000 gals acid, pump 849 bbls.

Reno County: Wildcat — Luther Mackall's Frederick 1, sw sw ne 4-26s-5w, Lansing 2803 ft, Miss 3549 ft, base Miss 3758 ft, Misener 3924 ft, Viola 3926 ft, Simpson shale 3986 ft, Simpson sand 3990 ft, Arb 4074-4100 ft, abnd 4100 ft.

Reno County: N. E. Peace Creek—Cities Service's Estey 1, ne nw nw 14-23s-10w, Viola 3758 ft, td 3770 ft, 500 gals acid, potential 3000 bbls.

Reno County: Peace Creek—Magnolia's Yust 4, sw se sw 15-23s-10w, Viola 3768 ft, td 3775 ft, 500 gals acid, potential 3000 bbls.

Rice County: Keesling—Brown & Williard's Proffit 3, c e½ ne nw 9-20s-9w, Arbuckle 3224 ft, td 3236 ft, pump 549 bbls.

Rice County: Semi-Wildcat—Sharon Drlg. et al's Schubert 1, c n½ nw se 9-20s-10w, Arb 3421 ft, td 3424 ft, pb 3336 ft, abnd.

Rooks County: Westhusin — Wakefield's Westhusin Est. 1, ne ne nw 14-9s-17w, Arb 3512 ft, td 3537 ft, pb 3400 ft, 1000 gals acid, perf 3211-3215 ft, in Lansing, pump 7 bbls oil and 25 bbls water.

Russell County: Hall—R. H. Shield's Letsch 10, sw sw se 27-14s-13w, Lansing 2832 ft, td 2875 ft, 10,000 gals acid, pump 1460 bbls.

Russell County: Greenvale—Stanolind's Zeaman 2, c n½ ne ne 9-15s-12w, Reagan 3306 ft, abnd 3466 ft.

Russell County: South Big Creek—El Dorado Ref.'s St. Aubyn 1, nw nw ne 1-15s-15w, Gorham 3194 ft, abnd 3224 ft.

Stafford County: Shaffer—R. L. Windmuller et al's Fanshier 1, c n½ ne ne 9-21s-13w, Arb 3570 ft, abnd 3574 ft.

WILDCAT STARTS

Barton County—Derby et al's Axman 1, c s½ se sw 29-17s-15w, mim. Adair & Morton's Jones 1-A, sw sw ne 30-28s-7e, rum.

Phillips County—Carter's Mungon 1, c sw sw 5-3s-16w, lcn.

Reno County—Simpson's Souder 1, ne ne ne 32-23s-10w, lcn.

Rooks County—Palmer's Baum 1, c s½ sw ne 10-10s-16w, mim.

Rush County—Luther Mackall's Herrman 1, c e½ se ne 2-16s-18w, dr.

West Texas

Barnhart Ellenburger Indicated Large Area

Shallow gas blowout by offset to Andrews County deep discovery. Ellenburger zone in Barnhart pool due to embrace large producing area. Upper basin to receive Ordovician wildcat project in Lamb County. Briscoe County wildcat abandoned without shows after drilling through Permian and Pennsylvanian to 8200 ft.

Andrews County: Fullerton Oil Co.'s Wilson 2, west offset to its 7200-ft Clear Fork oil discovery, blewout in Yates sand at 3125 ft, rated 6,000,000 ft dry gas daily, and drilling 3610 ft. Fuhrman Petroleum Corp's Thornberry 1, 4600 ft south by east of its discovery in the West Fuhrman pool, flowed 146 bbls 31.2-gr oil, plus 1.9 percent water, ¾-in choke, after nitro shot and acid treatment of broken pay 4340-4540 ft. Texas Pacific Coal & Oil Co. and Seaboard's Midland 1-D, third test on geophysical prospect in southeast corner of county, logged Grayburg 4460 ft, elev 2901 ft, 27 ft high to initial test that almost qualified as commercial pumper.

Lubbock County: J. R. Sharp et al's Holman 1, 2½ miles south of county's single pumper in Clear Fork, was drilling at 3900 ft, having entered San Andres at 3190 ft, elev 3203 ft, 90 ft low to discovery. However, the regional dip is steep to the south.

Ward County: Stanolind's Byrd 1,

3½ miles south of Spencer pool and on narrow reef-type structure, awaiting nitro shot after showing small volume oil and gas, having plugged back from water at 2880 ft to 2679 ft, elev 2594 ft. Shell's Sealy-Smith 1, wildcat, drilling 8980 ft in upper Ordovician. Failed to show in Devonian and Silurian zones.

Ellenburger Failures: In Western Crockett County, Moore Exploration and Olson Oil Co.'s Halff 2-C, ⅞ mile west of Soma-Noelke shallow pool discovery, abandoned after acidizing mid-Permian saturation 3608-3752 ft, having plugged back from water in Ellenburger 6740-6977 ft. This is nearest deep test to Yates field, where deep mineral rights are in big demand. In Northeastern Pecos County, Magnolia's Price 1, 8½ miles southwest of McCamey and 6 miles east by north of Wentz pool, yielded sulphur water, tested 5382-5412 ft in Ellenburger, topped at 5200 ft, elev 2313 ft. Drilling dolomite 5490 ft, and may continue to granite.

Reagan County: Amerada's University 1-R-D, C NW SW Sec 1, Blk 48, 1½ miles east by south of the Barnhart pool discovery, was showing considerable oil and gas with fresh (rotary) water while unloading with swab. Production is from casing perforations 9080-9155 ft in Ellenburger, topped at 9038 ft, elev 2698 ft, being 148 ft low to discovery, but only 42 ft low to pool's second and largest producer. It is apparent that this deepest producing pool in the district will embrace a large area.

Winkler County: Ralph Lowe et al's Brown-Altman-Humble 1, 1¼ miles north of Weiner pool, earned potential rating of 184 bbls 35-gravity oil ¾-in choke after 540-quart nitro shot 3050-3180 ft, plugged back from water at 3212 ft, elev 2818 ft. Development of intermediate acreage already under way by independents.

Abell: Magnolia's State-Loar 1, mile southeast of production, drilling shale 5418 ft; topped Simpson and Tulip Creek at 4945 ft and 5145 ft, respectively. Structurally low but considered within the producing contour. Company's Lutz 1, northeast outpost, tested sulphur water in McKee sand, topped at 5334 ft, and coring shale 5855 ft.

COMPLETIONS

Briscoe County: Wildcat — Phillips' Montague 1, c nw ne AB&M 6, blk B-4, abnd black shale 8200 ft.

Cochran County: Slaughter — Anderson-Prichard's Woodley 6, 3529 ft from e and 440 ft from n lines lse, leag 57, Oldham CSL, pump 424 bbls, acid 29,250 gals, perf 4966-70 ft, pay 4911-5040 ft, Magnolia's Dean 1-A, 660 ft out sec 1809-ac lse, leag 58, Martin CSL, flow 317 bbls cas, acid 10,500 gals 4930-80 ft.

Crane County: Gulf-Waddell—Gulf's Waddell 51, ne se nw PSL 6, blk B-24, pump 168 bbls 35-gr, shot 570 qts 3235-3385 ft, td 3390 ft.

Crane County: Jordan—E. E. Fogelson et al's University 5-C, nw se sw sec 8, blk 35, flow 554 bbls 2-in, shot 955 qts 3445-3675 ft.

Crockett County: Soma-Noelke—A. J. Rife et al's Cohen 2, sw nw sw of w½ of double sec 27, blk GG, M. T. Willion sur, flow 341 bbls 1-in, 1135-64 ft.

Crockett County: Wildcat — Moore Explo. Co. and Olson Oil Co.'s Halff 2-C, 467 ft fr s and 1638 ft fr e lines I&GN 68, blk 1, elev 2316 ft, Ellenberger 6740 ft, abnd 6977 ft.

Crockett County: World-Powell — H. G. Eastham Jr et al's Powell-Gulf 1-A-X, nw c GC&SF 63, blk BB, pump 86 bbls oil and 25 bbls water, acid 1500 gals 2655-75 ft.

Dawson County: Wildcat—Magnolia's Scanlan 1, c se ne EL Ry 113, blk M, elev 3142 ft, anhydrite 2163 ft, Yates grains 2910 ft, brown lime 4070 ft, San Andres 4665 ft, abnd 5100 ft.

Ector County: Foster—Continental's Johnson 9-B, ne se ne T&P 5, blk 42, T-2-S, flow 324 bbls 2-in, shot 375 qts 4180-4300 ft. C. O. Davis, Tr's Judkins 1, nwc sw T&P 16, blk 42, T-2-S, flow 1134 bbls 2-in, shot 400 qts 4357-4443 ft. Drilling & Exploration's Kone 1, c nw nw T&P 43, blk 42, T-2-S, flow 222 bbls ⅞-in, shot 425 qts 4186-4311 ft.

Ector County: North Cowden—Carl B. King Drl. Co.'s Holt-Landreth 2-A, c w½ se se T&P 16, blk 43, T-1-N, flow 409 bbls 2-in, shot 130 qts 4353-4387 ft, Sinclair Prairie's Johnson 33-C, nec sw T&P 25, blk 43, T-1-S, flow 783 bbls 2-in, shot 330 qts 4083-4173 ft. Stanolind & Magnolia's Holt 6, 880 ft fr n & 1760 ft fr w lse, T&P 18, blk 43, T-1-N, pump 187 bbls, shot 734 qts 4430-4720 ft.

Gaines County: Cedar Lake — Stanolind's Collett 2, c nw sw PSL 5, blk C-30, swab 704 bbls, shot 750 qts 4660-4800 ft, td 4835 ft.

Gaines County: Wasson — Amon Carter & Continental's Willard 3-A, swc nw PSL 39, blk AX, flow 519 bbls ¾-in, acid 9000 gals 4860-5025 ft.

Hockley County: Slaughter — Falcon Co.'s Grant 2, sec lab 12, leag 42, Rains CSL, flow 480 bbls cas, acid 10,000 gals perf 4918-45 ft, td 4946 ft. Magnolia's Mallet 7-B, se c lab 4, leag 50, Scurry CSL, flow 1368 bbls cas, acid 10,500 gals 4960-5010 ft; Mallet 17-B, se c lab 8, leag 50, Scurry CSL, flow 865 bbls 2-in, acid 10,500 gals, td 5025 ft. Stanolind's Slaughter 25-A, center lab 75, leag 37, Zavalla CSL, flow 146 bbls 11/32-in, acid 4000 gals 5015-65 ft, td 5085 ft. The Texas Co.'s Mallet 17-B, sw c lab 21, leag 49, Scurry CSL, flow 833 bbls cas, acid 12,000 gals 4955-5026 ft; Slaughter 99, ne c lab 72, leag 38, Zavalla CSL, flow 1363 bbls cas, acid 12,000 gals 4905-5023 ft; Slaughter 102, center lab 80, leag 37, Zavalla CSL, flow 1416 bbls cas, acid 12,500 gals 4900-5020 ft; Slaughter 107, nw c lab 90, leag 38, Zavalla CSL, flow 2178 bbls cas, acid 12,500 gals 4960-5035 ft; Slaughter 108, nw c lab 78, leag 38, Zavalla CSL, flow 1269 bbls cas, acid 12,000 gals 4934-5006 ft; Slaughter 110, nw c lab 77, leag 38, Zavalla CSL, flow 2156 bbls cas, acid 14,000 gals 4940-5031 ft; Slaughter 112, flow 1717 bbls cas, acid 9000 gals 4980-5043 ft. Western States Gasoline Corp.'s Frazier 16, 440 ft fr n & 3408 ft fr e lines PSL 9, blk X, flow 1869 bbls 3-in, acid 10,000 gals 4920-5005 ft.

Howard County—Mid-Continent Pet. Corp's Denman 1-B, nec s½ of s½ T&P 16, blk 30, T-1-S, pump 344 bbls, shot 490 qts 2615-2861 ft.

Lubbock County: Wildcat—Geo. P. Livermore's Moxley 1, c sw sw HE&WT 64, blk 20, elev 3203 ft, anhydrite 2060 ft, Yates 2960 ft, San Andres 3890 ft, abnd 6405 ft.

Pecos County: Apco — A. W. Thompson's Gregg-Texaco 2, c n¼ of n¼ H&GN 101, blk 10, 2248 bbls ¾-in, acid 5000 gals, Ellenburger 4630-4700 ft.

Pecos County: White-Baker—Cardinal Oil Co.'s White-Baker 4-K, sec nw TC Ry 4, blk 179, shot 80 qts 2000-19 ft, abnd 2050 ft.

Pecos County: Yates—Standard of Texas' Smith 4, lse 5, sw se GC&SF 16, blk 194, 356 bbls natural 1-in, 1728-77 ft.

Scurry County: Northwest—Jas. H. Beall et al's Sorrells 3, sw ne se H&TC 101, blk 97, pump 141 bbls, shot 240 qts 1604-1765 ft, td 1786 ft.

Scurry County: Sharon—Coffield & Guthrie's Burney 3, sec ne H&TC 144, blk 97, pump 71 bbls, shot 370 qts 2300-2450 ft. D. & R. Oil Co.'s Burney 14, nw se ne H&TC 143, blk 97, pump 141 bbls, shot 930 qts 2212-2461 ft.

Winkler County: Keystone—Sid Richardson and Bass, Inc.'s Jenkins 7-A, 440 ft fr n & 1320 ft fr e PSL 12, blk 77, flow 273 bbls 1-in, shot 280 qts 3402-92 ft, td 3502 ft. Standard of Texas' Baird 19, sec 36, sec sw PSL 19, blk B-3, flow 212 bbls cas, shot 300 qts 3246-3370 ft.

Yoakum County: Wasson—American Liberty Oil Co. and Atlantic's Elliott 5, c se sw sec 769, flow 300 bbls, plus 19% bs&w, gas lift, acid 10,500 gals 5030-5238 ft. Drilling & Exploration's Stanford-Humble 2-A, nec se sec 836, flow 406 bbls 9/16-in, acid 9000 gals 4875-5125 ft.

OLD WELLS DEEPENED

Ector County: North Cowden—Trans-Southern Pet. Co.'s Holt-Texaco 1-A, se c T&P 16, blk 43, T-1-N, otd 4400 ft, pump 8 bbls, shot 565 qts 4380-4565 ft.

Mitchell County: Wildcat—Butler & Horne Drl. Co. (was Wilbanks et al's) Brown 1, se ne ne T&P 43, blk 27, otd 1000 ft, elev 2087 ft, top lime 1440 ft, shot 210 qts 2930-3010 ft, abnd td 3203 ft.

Ward County—T. P. Coal & Oil Co.'s Barker 16, PSL 27, blk B-29, otd 2407 ft, deepened to sul w 2717-19 ft, pb to 2650 ft, pump 44 bbls 13 hrs.

WILDCAT STARTS

Andrews County—Mascho Oil Co.'s University-Sun 1, c ne ne sec 27, blk 10, 2 mi nw Emma pool, lcn.

Texas Panhandle

COMPLETIONS

Carson County—Cities Service Burnett 46-A, I&GN 32, blk 4, 39,000,000 gas, 337 lbs pressure, 2550-2640 ft, td 2651 ft.

Gray County—L. R. Hagy-Harrington & Marsh's Sheridan 1, 1320 ft from n and 2310 ft from w lines H&GN 214, blk B-2, 58,000,000 gas, 348 lbs pressure, 2780-2915 ft, td 2975 ft. Tharp & Smith's Short 4, H&GN 2, blk 1, pump 336 bbl, shot 535 qts 2864-2984 ft.

Hutchinson County — Continental's Sanford 4-C, H&TC 79, blk 46, pump 195 bbl, 2787-2805 ft. Shell's Harvey Sisters 42-B, TCRy 14, blk M-21, pump 307 bbl, shot 170 qts 3024-90 ft; Terry 3, TCRy 15, blk M-21, pump 250 bbl, shot 160 qts 3030-90 ft. Harry Stekoll et al's Perkins 11, TCRy 36, blk M-23, pump 48 bbl, shot 2975-3093 ft.

Moore County—Canadian River Gas Co's Kilgore 4-A, sec 12, blk P.Mc, 7,500,000 gas, 367 lbs pressure, 3607-3648 ft.

West Central Texas

COMPLETIONS

Callahan County—Wm. D. Austin et al's Finley 1, sw ne ne BOA 77, abnd 1125 ft.

Jones County: Wildcat—Falls Ref Co's Reynolds 1, SWc lse, C&MRy 3, elev 1593 ft, abnd 2002 ft.

Jones County—Humble's Huddleston 2-B, c sw se T&P 38, blk 18, elev 1827 ft, abnd 3046 ft.

OLD WELL DEEPENED

Comanche County: Wildcat—Capt. A. F. Woodfin and Placid Oil Co's Pettit 1, Elizabeth Tatum sur, otd 3276 ft, top Ellenberger 3277 ft, abnd 3427 ft.

WILDCAT START

Callahan County—Ben Dansby et al's W. A. Ramsey 1, 660 ft out NEc TE&L 2277, lcn 4500-ft test.

North Texas

Wilbarger Ordovician Well Indicates Good Flow

Ordovician discovery in southeastern Wilbarger County blew out while drilling in to indicate prolific flow. Cooke County shallow prospect yields water. Montague County has unusual number wildcat and semi-wildcats nearing decisive levels.

Wilbarger County: Consolidated Oil Co. et al's Potts 1-D, 3910 ft from south and 3300 ft from east lines H&TC 4, Blk 7, 2 miles south of Consolidated and 2¾ miles west of K-M-A fields, nearest Ellenburger areas, blew out while drilling dolomite pay 4532-39 ft in Ellenburger, topped at 4532 ft. Previously had cemented 5-in 4500 ft after logging promising saturation in Mississippian at 4508-30 ft, with top of this zone at 4493 ft. Earlier attempts to extend the Ellenburger pay in the K-M-A field to the west had established the presence of Mississippian. Consolidated's Ancell 1-K-E, NE SW NW H&TC 2, originally completed as southernmost Strawn producer in Consolidated pool, deepened to Ellenburger at 4356-4419 ft with negative results, then plugged back to 4035 ft to test broken saturation in Bend, topped at 3988 ft.

Montague County: Continental's Mueller 1, P. Hamilton Survey, 6 miles east of Bowie and on geophysical prospect, proved dry on drill-stem test 6000-51 ft in Bend, topped at 5992 ft, then resumed coring. Company's Yowell 1, SE NE Sec 8, 1-mile north by west of its Stoneburg pool discovery, entered Bend 5986 ft, 33 ft high to discovery, and was coring 6050 ft after recovering 30 ft of gas-cut mud when tester used at 5980-6031 ft. Continental's Penn 1, east offset to Gant-Turner pool discovery, drilling 6055 ft with first Bend zone due at this level. Sinclair Prairie's trio of wildcats in Montague County nearing interesting levels, with Jones 1, 1¼ miles northeast of Forestburg, drilling shale 6360 ft.

Schist Peak: In northwestern Denton County, Hunt Oil Co.'s Forrester 1, W. Nelson Survey, projected 5500-ft wildcat, abandoned at 2520 ft in Schist encountered abnormally high as above concern's Jones 1, 3 miles northwest,

missed the impervious zone and quit in Ellenburger 5580-5633 ft.

Grayson County: Sinclair Prairie's Wheeler 1, 1½ miles southwest of Collinsville, proved dry in Ellenburger 3947-4514 ft, but has cemented 7-inch at 3735 ft to try for production in Strawn.

Wise County: Hunt Oil Co.'s Stack 1, Chico area, logged streaks oil stain and odor in dolomite 6896-6913 ft, and was drilling at 7000 ft to establish water level in Ellenburger.

Archer County: Continental's Ferguson 1, midway between Hull-Silk and K-M-A fields, proved dry in Ellenburger 4894-5270 ft, then plugged back to 4550 ft, 7-in 4504 ft, to resume testing saturation 4511-21 in Bend, topped at 4468 ft. Sinclair Prairie has plugged back and cemented pipe to test its two wildcats in east portion county. Coleman 1, SWc Blk 6, 3¾ miles northeast Scotland pool, failed to produce in Ellenburger 5879-92 ft, and was testing nominal saturation in Bend, topped at 5292 ft, with 5½-in at 5271 ft. Company's Sloop 1, 1¼ miles southeast Vogtsberger discovery, cemented 7-in at 4641 ft after drilling to 5491 ft, entered Bend at 5200 ft, being 82 ft low to nearest Bend producer.

Cooke County: Panhandle Ref. Co.'s Welch 1, M. W. Ross Survey, 6 miles north of Muenster, abandoned after testing water through perforations 1138-52 ft, having plugged back from 1932 ft.

Clay County: Deep Oil Development Co.'s Hapgood 1-A, southeast outpost for New York City pool, established first Strawn production in pumping 125 bbls oil and 24 bbls water initial from perforations 4925-30 ft, with oil sand logged at 4912-37 ft and 4941-52 ft. It is first in area to fail to produce in Mississippi, topped at 6380 ft, 52 ft low.

COMPLETIONS

Baylor County: Wildcat—Mazda Oil Corp's Wirz 1, c ne se BBB&C 1, Bend 5408 ft, abnd 5508 ft.

Clay County: Wildcat — Bridwell Oil Co.'s Edrington 18, 50 ft from s and 1650 ft from w lines HT&B 35, Canyon 2004 ft, abnd 2094 ft.

Clay County: Halsell — Bridwell Oil Co.'s Halsell 10-A, 2332 ft from w and 1244 ft from n lines WCRy 9, flow 351 bbl ½-in, shot 40 qts 4760-90 ft.

Clay County: New York City—Deep Oil Dev Co's Hapgood 1-A, Jas. Walker sur, new and shallowest oil zone, pumped 125 bbl oil and 25 bbl water, basal Strawn, 4911-25 ft, plugged back from dry Simpson 6428-6544 ft.

Cooke County: Wildcat—J. Z. Werby et al's Scroggins 1, 1250 ft from s and 700 ft from w lines of S. P. Yearwood sur, A-1534, ½-mi e Mountain Springs, abnd 3006 ft.

Jack County: Hoefle—Hanlon & Buchanan's Hoefle 1-C, 467 ft out of NEc of e 30.53-ac of s 72.34-ac J. W. Barrett sur, 768 bbl 18/64-in, acid 2000 gals Bend 4768-4812 ft, td 4818 ft.

Jack County—Rankin & Elliott Prod Co's Stewart 1-B, 660 ft out NWc TE&L 2783, flow 56 bbl ½-in, acid 14,000 gals 4358-78 ft and 4512-32 ft.

Wichita County—A. Fisher and W. J. DuBose's Cooper 1, BBB&C 1, pump 7 bbls, shot 5 qts 632-44 ft. C. Y. Gorman et al's Doyle 1, Geo. Wheelwright sur A-320, sec 1, abnd 1264 ft, R. G. Drilling Co's Warren 6, KWVFL 32, pump 47 bbl 1769-75 ft, Gordon Rogers et al s Greever 1, Pratt Subdiv blk 5, abnd 1431 ft.

Wichita County: K-M-A—Venmex Oil Co's Big Wichita River 17-A, flow 653 bbl ¾-in, Strawn 3746-90 ft.

OLD WELL DEEPENED

Clay County: Wildcat—L. T. Burns et al's Lyles 1, 1000 ft from e and 1230 ft from s lines blk 27, San Augustine University sur, otd 5606 ft, top Mississippi 6074 ft, Ellenberger 6198 ft, abnd 6298 ft.

WILDCAT STARTS

Archer County—Harris & Taylor's Woods 1, 330 ft out ne c n 50-ac of w& blk 4, Wm. Ainsworth and Meade Pasture sur, lcn. C. F. Schram et al's J. Sternadle 1, 660 ft fr n & 330 ft fr w lines blk 19, J. R. McDowell sur A-282, sp.

Southwest Texas

Seeligson Has Increased Drilling Program

Seeligson with an increased drilling program as a result of new expansions becomes Southwest Texas' newest hotspot.

Jim Wells County: Magnolia's Seeligson 28, one mile north Seeligson production, ran electric log 7277 ft, now drilling below 7351 ft on deep test. Humble has started east outpost on King ranch.

Bee County: Shield Oil Co.'s Heard 1, perforated 5073-77 ft, flowed salt water, will complete in 4800-ft Frio gas sand. Will open new field 10 miles southeast Beeville.

Frio County: Wiegand Brothers' Gilliam 1-A, just west Pearsall townsite, pumped 35 barrels 44-gravity oil in 12 hours from crevice topped 4870 ft; pump rig broke down. Would open new pool.

Jackson County: Gulf's Simons 1, southwest outpost Texana, drilling 7085 ft; Sinclair-Prairie's Gardner 1, northwest outpost to same field, drilling 7425 ft. Both far below regular sands of field.

Webb County: Magnolia's McLean 2, ¼-mile south McLean field, tested dry 35 minutes in sand 3250-72 ft, drilled to 3535 ft and abandoned.

LOWER GULF COAST

COMPLETIONS

Aransas County: Wildcat—Humble's Kent & Crane 1, C. O. Gilliland sur, Live Oak Peninsula, 6 mi ne Rockport, abnd 11,798 ft.

Brooks County: LaGloria—LaGloria Operators Committee's S. LaGloria unit 3, lot 4, blk 6, 3490 ft sw prod, abnd 7431 ft.

Brooks County: Wildcat—Sun's Cage 3, L. Vargas Guadalupe sur, 12 mi sw Falfurrias, abnd 6215 ft.

Jackson County: Maurbro — Humble's Edwards 1, A. M. Clare lge, salt water in sand 5217-38 ft, gas 5175-87 ft, abnd 5238 ft.

Jackson County: North LaWard—Moore & Ahern's Olsovsky et al 2, blk 7, 72 bbls 24.8-gr, gas lift, perf 5212-23 ft, td 5229 ft.

Jackson County: West Ganado—Pure's Fowler 3, Rogers sur, abnd 5250 ft.

Jackson County: Wildcat—W. S. Boyle & J. G. Mayo's Reserve 1, blk 10, Allen Pasture sub, J. Heard sur, 3 mi nw Maurbro fld, abnd 7508 ft.

Jim Wells County: Ben Bolt—Graham Bros.' Blake 2, Carrejo gr, abnd 4884 ft.

Jim Wells County: Seeligson—Sun's Canales 5, sec 364, flow 121 bbls 41.8-gr oil 7/64-in chk, 1080 lbs tp, 1220 lbs cp, perf 5988-92 ft, gas/oil ratio 580/1, sand 5970 ft, td 6010 ft.

Live Oak County: Oakville — Moore Dev. Co.'s Wilson 1, S. McGloin sur, flow 81 bbls 24-gr, ¾-in chk, 275 lbs tp, 1000 lbs cp, perf 2733-38 ft, gas/oil ratio 700/1, td 2740 ft. Simmons Oil Co.'s Reagan 5-C, L. Romaro sur, flow 72 bbls 24-gr, ⅝-in chk, 290 lbs tp, 980 lbs cp, perf 2740-44 ft, gas/oil ratio 720/1, td 2745 ft.

Nueces County: Bentonville-King—Southern Minerals Corp.'s King 24, sec 6, flow 73.14 bbls 39.3-gr, 7/64-in chk, 680 lbs tp, 975 lbs cp, perf 5605-10 ft, gas/oil ratio 1368/1, sands 5604 ft, td 5612 ft.

Nueces County: Minnie Bock—E. A. Graham's Riedel 1-B, sec 43, flow 45 bbls 24-gr plus 2% sw, ⅛-in chk, 175 lbs tp, 680 lbs cp, perf 3792-3803 ft, gas/oil ratio 246/1.

San Patricio County: Wildcat—H. A. Lindsay, Tr.'s Timon 1, blk 29, San Patricio de Hibernia Gr, band 4685 ft.

OLD WELL DEEPENED

Jim Wells County: Alice—Southern Minerals Corp.'s Stillwell 2, lot 17, Collins sub, flow 127.5 bbls fluid, 73% 49.6-gr condensate, 27% sw plus 1,098,000 gas, ⅛-in chk, 3900 lbs tp, cas sealed, pipe, old td 6424 ft, new td 7767 ft.

WILDCAT STARTS

Goliad County—J. M. Wren's Yanter 1, ne cor 80-ac lse, M. J. Ybarbo gr, 1 mi ne Charco, lcn 4500-ft test.

Jackson County—John B. Coffee's Mauritz 1, Morris & Cummings sur No. 21, w of Mauritz field, lcn 6500-ft test.

Jim Wells County—Navarro Oil Co.'s Almond 1, SA&MG 12, 7000 ft sw Alfred field, lcn 6000-ft test.

SOUTHWEST TEXAS

COMPLETIONS

Duval County: Hoffman — Magnolia's Weil 26, Sec 113, pump 48.72 bbls 21.2-gr oil, sand 2690-95 ft, 7-in 2690 ft, td 2695 ft.

Duval County: Wildcat—Henderson Coquat's Hyatt 1, blk 6, 4 mi sw Benavides, abnd 5302 ft.

Jim Hogg County: Colorado — Humble's King-Colorado 58-B, Las Moritas gr, flow 208 bbls 46.5-gr, ¼-in chk, 160 lbs tp, 700 lbs cp, gas/oil ratio 200/1, sand 3059 ft, 5½-in 3052 ft, td 3067 ft.

Jim Hogg County: Las Animas — Sollars Royalty Co.'s McLean 10, blk 6, Las Animas gr, flow 22 bbls 19-gr and 52 bbls salt water, 7/16-in ch, 140 lbs wp, perf 1794-1804 ft, sand 1799 ft, td 1815 ft.

Starr County: Rincon—Continental's Slick 62-B, sec 506, flow 152 bbls 41.2-gr, 3/16-in chk, 365 lbs tp, 610 lbs cp, perf 4019-35 ft, gas/oil ratio est 550/1, sand 4024 ft, td 4080 ft.

Starr County: Sun—Humble's V. Saenz et al 3, Los Retachez gr, flow 112 bbls 46-gr, ⅛-in chk, 700 lbs tp, 750 lbs cp, gas/oil ratio 650/1, sand 4634-46 ft, 5½-in 4637 ft, td 4650 ft.

Starr County: Wildcat—Forest Dev. Co.'s Mendoza 1, sur 301, 20 mi nw Rio Grande City, abnd 1607 ft.

Webb County: McLean—Magnolia's McLean 1, sec 121, pump 218 bbls, sand 3251-56 ft, td 3256 ft.

OLD WELL DEEPENED

Webb County: Carolina-Texas—Transwestern and Continental's Houston Oil Co. 1, blk 13, sur 268, originally comp as condensate well by Cartter-Rubsamen, then deepened to Wilcox, test sw, show o&g, old td 5104 ft, abnd 9228 ft.

WILDCAT STARTS

Duval County—Tom Callaghan's Gravis 1, se cos sec 240, 1¼ mi e Palangana salt dome, lcn.

Webb County—O. W. Killam and Mid-States' Puig, blk 111, Las Albercas gr, 10 mi s Mirando City, lcn 3500-ft test. Kirkwood & Morgan's Puig 1, Las Albercas gr, lcn 3350-ft test.

SOUTH CENTRAL TEXAS

COMPLETIONS

Bastrop County: Wildcats—Marts & Beaven Oil Co.'s Elgin Standard 1-A, Wm. Goodwin sur, 2 mi se Elgin, Edwards 3332 ft, abnd 3350 ft. H. A. Pakenkopf's Bell 1, A. Black sur, 14 mi nw Bastrop, 7-in 3102 ft, Edwards 3126 ft, abnd 3150 ft.

Wilson County: Floresville—H. J. Baker's McDaniel 1, H. J. Arocha sur, sand 648-53 ft, abnd 655 ft; Myers 2, H. J. Arocha sur, sand 649-52 ft, abnd 652 ft, Myers 3, sand 653-62 ft, abnd 662 ft.

East Texas

Hawkins Production Extended Southeast

Shore-line trend across Cherokee County lists Woodbine failure. Anderson County gains new prospect and a dry hole. Hawkins extended southeast.

Anderson County: Magnolia's Campbell 1, southwest corner of 90-acre tract J. B. McNealy league scheduled 6000-ft test, with Woodbine due near 5100 ft; on 6000-acre block 3½ miles northeast Montalba. K. R. Voelkel and Wright Drilling Co.'s Rogers 1, 8 miles southwest of Elkhart and southwest of a junked gasser, abandoned in Woodbine water sand 5590 ft, with top Woodbine 5482 ft.

Cherokee Count: John Mayo and H. R. Burden's New Birmingham 1, 5 miles northeast of Rusk and on shore-line trend from East Texas field, entered Woodbine 4486 ft, elevation 379 ft, and halted in water sand 4510 ft.

Wood County: Magnolia's Jarvis College 1, southeast edge Hawkins field, flowed 277 bbls 24-gravity oil through 1-inch choke in three hours from Woodbine perforations 4694-4770 ft, and rig moved east for second test. S. H. Killingsworth et al's Green 2, northeast

twin location to 5100-ft failure, promises northeast extension for field, logged oil sand 4860-76 ft and Ashey sand showing oil 4882-95 ft, to 4897 ft, elev 390 ft. Will perforate. B. F. Phillips et al's Snyder 1, east outpost making pumping test with 5½-in on top of Woodbine at 4750-55 ft, total depth 5000 ft, elev 318 ft.

Chapel Hill: Sinclair Prairie's Walton 1, north end of field, flowed 273 bbls, 42.5 gravity oil ¼ in, gas/oil ratio 1030/1 from Pettit perforations 8052-8229 ft, and 230 bbls 74-gravity distillate in 18 hours ⅜ in, gas distillate ratio 19,000/1, from Paluxy perforations 5746-5818 ft. Deal is pending for market for the Paluxy gas, making it possible to produce both crude and distillate.

COMPLETIONS

Houston County: Navarro Crossing—W. W. Hinchliffe and B. Smith's Gilmore-Sun 2, NWc 91-ac lse, Nathan Wade sur, 20,000,000 gas, Woodbine perf 5859-68 ft, td 5890 ft.

Madison County: Wildcat—Sun Leonard 1, 650-ac tr, John Crownover sur, core test, abnd Wilcox, water 2591 ft.

Smith County: Chapel Hill—Sun's Warren 1, 1565 ft from w and 770 ft from n lines John Slaydon sur, flow 257 bbl, 678/1 gas-oil ratio, 3/16-in, acid 4000 gals Pettit perf 8207-33 and 8305-23 ft, td 8382 ft.

Wood County: Hawkins—Humble's Allen 6-D, 444.76-ac tr, Geo. Brewer sur, 429 bbl ¼-in, Woodbine perf 4700-92, td 4804 ft; H. C. LaForce 1, SWc 101-ac tr, W. Parker sur, 304 bbl ¼-in, Woodbine perf 4620-68 ft, td 4737 ft; Parrish 4, 134.53-ac tr, H. E. Watson sur, 90 bbl ¼-in, Woodbine perf 4507-15 ft, td 4603 ft. Magnolia's Jarvis College 1, 467 ft out NWc 156.7-ac tr, S. Castleberry sur, flow 2211 bbl 1-in, 24-gr, Woodbine perf 4694-4704 ft and 4747-70 ft, td 4800 ft.

Texas Gulf Coast

Camp Eleven Well on Sand; Aldine Wildcat in Shows

Sand cored in second well in Camp Eleven; Harris County wildcat drills ahead to Cook Mountain after finding oil shows.

Tyler County: American Republics & Houston Oil Co. cored Wilcox sand in the second well in the recently discovered Camp Eleven field. Formation, topped at 7998 ft, is flat with the producing horizon in the discovery.

In Fred, Stanolind's Parker 2 is running flat with the discovery while nearing Wilcox level. It is drilling at 8100 ft, the Wilcox section coming in around 8200 ft.

American Republics' and Houston Oil's Cushing Fee 1-1140, Ramers Island discovery, flowed 35 bbls through ⅛-in choke from perforations 5397-5400 ft, casing pressure 1800, tubing 1700. Production is from Cockfield, several previous tests producing large amounts of gas and some oil.

Harris County: George Strake's Phenix 1, Aldine area, has 4 or 5 thin sands showing oil and gas in Yegua, all about 7400 ft. The structure regarded as highly faulted, and the test will be carried to the Cook Mountain expected around 8100 ft.

In eastern part Harris County on flank Esperson dome, Atlantic has been conditioning mud to drill out cement after setting pipe at 6905 ft in A. B. Cohn 1. Operators had trouble keeping mud circulation after the wildcat attempted to blow out at 8820 ft. Electrical survey was run to 8506 ft before pipe was set, and now attempt will be made to run survey to bottom before resuming further operations.

San Jacinto County: Shell Oil Co. has staked W. J. Dunnan 1, second well in the new Mercy field. Location is in John R. Richardson survey, northwest of discovery.

COMPLETIONS

Brazoria County: Clemens Dome Wildcat—Shell's Clemens State Prison Farms 6, 3240 ft fr nl & 2157 ft fr wl of lse John McNeel Lge, abnd 6010 ft.

Brazos County: Millican Area Wildcat—Phillips' Fannie Schoeps 1, 1188 ft e of wl & 100 ft s of nl of E. M. Millican sur, ran elec log 5000 ft & 5190 ft, abnd 5194 ft.

Chambers County: Anahuac—Humble's Middleton 64, 1350 ft s & w of ne cor sec 64, abnd 7300 ft.

Liberty County: Wildcat—Superior's W. O. Smythe 1, 4900 ft fr e l & 467 ft fr s l of lse W. D. Smith Lge, ran log, abnd 10,066 ft.

Liberty County: Esperson—General Crude's Esperson Fee A-45, 300 ft fr wl & 1736 ft fr n l of lse GCSF sur, perf 7900-45 ft, flow 555 bbls ¼-in chk, tp 1150, cp 2100, gr 40.5, td 8403 ft. General Crude's Esperson A-47, 1380 ft fr nl & 1080 ft fr el of lse, completed as gasser, shut-in, td 8431 ft.

Montgomery County: Lake Creek—Stanolind & Amerada's T. A. McWhorter, 3625 ft fr nl & 467 ft fr wl 250-ac tr, T. J. Nichols sur, perf 9754-66 ft, flow 120 bbls dist 12 hrs ¼-in chk, tp 1500, cp 1875, td 12,300 ft. Superior's McWhorter 1-D, T. J. Nichols sur, 1850 ft se of 1-B, perf 9778-98 ft, flow 19 bbls hour, 60% salt water, 10/64-in chk, td 10,360 ft.

Wharton County: Wildcat—Sinclair Prairie's Mathilda Kubela 1, 467 ft n & w of se cor nw¼ sec 79, ETRR sur A-133, tested sand at 5330 ft, abnd 7615 ft.

Wharton County: Withers—F. W. Michaux' Pierce Est 42-A, 1320 ft n 28 deg w fr sel Thomas Westall sur, A-65, top sand 5313 ft, flow 146 bbls 10/64-in chk, tp 525, cp 500, gr 26, td 5321 ft. Michaux' Pierce Est 49-A, 5987 ft n 28 deg w fr sel Charles Howard sur, flow 162 bbls 5/32-in chk, td 5319 ft. Michaux' Pierce Est 65-A, 6920 ft n 28 deg w fr sel Charles Howard sur, flow 167 bbls 10/64-in chk, tp 575, cp 525, td 4515 ft. Michaux' Pierce Est 67-A, 2252 ft n 28 deg w fr sel Charles Howard sur, flow 170 bbls 10/64-in chk, top sand 5310 ft, tp 695, cp 700, td 5316 ft.

WILDCAT STARTS

Grimes County—Cockburn Oil Corp.'s Gayle 1, south of Plantersville, center of 156-ac tr

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Washington County — Eugene Jordan's H. Stolz 1, Burton area, abt 2500 ft nw Arkansas Fuel's Stolz 1 dry hole, 660 ft se alg nel 115-ac tr fr n cor & 660 ft sw at ra in J. B. Miller sur, pd 8000 ft, lcn.

Louisiana Gulf Coast

Avery Island Wildcat Drills Into Gas Sand

Wildcat on Avery Island, Iberia Parish, finds gas sands; Cities Service completes Jefferson Davis well as gas-distillate producer.

Iberia Parish: Gas production on the Avery Island prospect is assured with Humble's Petit Anse Co. 1 blowing dry gas from 6360 ft in sand. The well, located in sec 25-13s-5e, has been in hard sandstone and sand from 5800 ft to the present depth.

Jefferson Davis Parish: Cities Service has opened gas and distillate production on the Thornwell prospect with Lacassine Land Co. 1 flowing 39 bbls distillate on 12-hour test and a daily rate of 3,600,000 ft gas through ¼-in choke, flowing pressure 3200 pounds, shut-in pressure 3600 pounds. Production is from perforations at 9632-38 ft. Tests deeper in the hole yielded gas and distillate.

Beauregard Parish: Atlantic Refining Co. has opened another deep Wilcox sand in Neale field. Lilliedoll 1 extended production southward flowing 270 bbls from perforations at 11,030-38 ft. The new sand adds another to the multiple producing horizons of the Wilcox field.

COMPLETIONS

Beauregard Parish: Neale—Atlantic's Hawkins Unit 1, center ne se 27-3s-11w, perf 10,990-11,010, flow 300 bbls 3/16-in chk, gr 42.9, gor 2550-1, td 12,575 ft.

Cameron Parish: Lakeside — Lisbon-Iberia Oil Co.'s Calcasieu Bank 2, 660 ft s & el 13-12s-4w, perf 9820-90 ft, flow 75 bbls dist ¼-in chk, tp 3550, cp 800, td 10,110 ft.

Cameron Parish: Sweetlake—Pure's Yount Lee 26, 2608 ft s & 928 ft w ne 12-13s-8w, perf 6188-94 ft, 6208-18 ft, flow 72 bbls ¼-in chk, tp 465, cp 150, gr 32.4, td 7644 ft.

Evangeline Parish: Pine Prairie—Humble's Guillory 1, 960 ft s alg wl sec 37 fr nw cor in sec 37-3s-1w, perf 8300-13 ft, flow 389 bbls 3/16-in chk, tp 1300, gr 31.9, td 8352 ft. L. M. Josey & H. G. Nelms' Sam Haas Est 1, ¾-mi sw production, top Cockf 8065 ft, salt water sand 8072-8120 ft, abnd 8505 ft. E. J. Nicklos' Reed 2, 36-3s-1w, top Cockf 7764 ft, oil sand 7764-94 ft, perf 7780-92 ft, flow 794 bbls ¼-in chk, tp 1500, cp 1525, gr 41.6, td 7815 ft, new sand. Stanolind's Octave & Vernal Ardoin Unit 1, 743 ft swc 37-3s-1w, drilled to 8506 ft, pb to 8177 ft and sidetracked toward dome, perf 8278-96 ft, flow 55 bbls 3/16-in chk, td 8566 ft.

Evangeline Parish: Ville Platte—Continental's Deville 3, 1600 ft s 295 e nw c 27 in 26-3s-2e, perf 10,045-72 ft, flow 172 bbls 12/64-in chk, tp 1250, td 10,263 ft. Continental's Haas-Vidrine Unit 35-1, 1650 ft sw & 450 ft nw e cor 44-3s-2e, set retainer 10,017 ft and gr 55.4, td 10,169 ft; J. E. Virdine 2, 3375 ft Tate 4 Unit 27, sec 41-4s-2e, perf 9890-9902 ft, flow 76 bbls 14 hrs 12/64-in chk, tp 1875, gr 55.4, td 10,169 ft; E. Vidrine 2, 3375 ft fr se 480 ne w cor sec 42 flow 133 bbls 12/64-in chk, td 10,087 ft.

Iberville Parish: St. Gabriel—Shell's Natalbany 4, se nw 18-9s-2e, perf 8590-8602 ft, 8613-24 ft, 8635-50 ft, flow 259 bbls ⅛-in chk, tp 1250, cp 1225, gr 33.6, td 8652 ft.

Jefferson Parish: LaFitte—Texas Co.'s LLE-LaFitte 20, 4965 ft n & 3137 ft e sw cor sec 20-17s-24e, perf 9446-90 ft, flow 328 bbls 5/32-in chk, tp 1050, gr 36.1, td 10,165 ft.

Jefferson Parish: Westwego—Reese E. Carter's Cravin 2, 635 ft ne alg el sec 5 fr s cor then nw 1300 ft at ra in sec 3-13s-23e, perf 10,054-56 ft, flow 89 bbls 5/32-in chk, td 10,162 ft.

Plaquemines Parish: Quarantine Bay — Gulf's State-Quarantine Bay QQ 36 Lse 1953, sec 7, perf 8977-89 ft, flow 303 bbls 5/32-in chk, td 9000 ft.

St. Charles Parish: Paradis — Texas Co.'s LLE-Paradis 18, 1995 ft s & 3000 ft w ne cor sec 7-14s-20e, perf 10,320-35 ft, flow 379 bbls 3/16-in chk, tp 1225, gor 679-1, td 10,470 ft.

St. Martin Parish: Lake Mongoulois—Texas Co.'s State-Lake Mongoulois 11, 6059 ft e & 4354 ft s sw cor sec 10-10s-9e, abnd 10,376 ft.

St. Mary Parish: Bayou Sale — Humble's Wooster 4-B, fr se cor go 4065 ft sw alg nw l sec 1, thence 600 ft se at ra to sec line in 16-16s-9e, flow 274 bbls 9/64-in chk, tp 1275, td 10,160 ft.

St. Mary Parish: Belle Isle—Sun's Belle Isle 2, 990 ft fr n & 120 ft fr el sec 1-18s-20e, abnd 6222 ft.

Terrebonne Parish: Gibson—Shell & Barnsdall's Realty Operators 8-B, 22-17s-15e, flow 406 bbls 10/64-in chk, tp 1510, csg 1445, gor 710-1, gr 37, td 9210 ft.

North Louisiana

Claiborne Parish Deep Test Quits in Salt

H. L. Hunt's Mitchiner 1, C SW SW 15-23n-7w, Claiborne Parish wildcat drilled into Permian salt and abandoned depth 11,255 ft. In North Lisbon, Union Producing Co.'s McDonald 1, C SW 13-21n-5w, drilled below 12,235 ft without having picked up Permian salt.

Haynesville: Nine locations staked by Ohio Oil Co. for Pettit sand tests, bringing total operations to 20 of which 15 have not spudded.

Rodessa: On one of the "noses" off the fractured southwest end of the Rodessa axis, John Messenger and Associates' Benefield & Singleton 1, John Wanhope Survey, Cass County, Texas, four miles north of production at Lodi, ran electric log and prepared to run casing at total depth 6205 ft after logging 35 ft of porosity in Gloyd sand of Rodessa series in Glen Rose. Elev 230 ft. Base massive anhydrite 5748 ft, 40 ft high on Lodi producers.

COMPLETIONS

Caddo Parish: Hosston—Bayou State Oil Oil Co.'s B-2, 22-21n-16w, pump 8 bbls, 1044 ft.

Caddo Parish: Vivian-Pine Island—A. P. Gilbert's Bell 1, 34-22n-16w, flow 20 bbls hr, 2470 ft.

Claiborne Parish: Wildcat — H. L. Hunt's Mitchiner 1, c sw sw 15-23n-7w, elev 267 ft, massive anhydrite 3897-4088 ft, Buckner 10,500 ft, cored 17 ft sand in Buckner with odor distillate 10,924-41 ft, cored strks rock salt 11,235-44 ft, abnd 11,255 ft, Permian salt.

LaSalle Parish: Nebo—H. L. Hunt's Goodpine A-42, sw ne 21-7n-3e, perf 4024-34 ft, pump 128 bbls, 4118 ft. Patrick et al, Goodpine 1, ne ne 21-7n-3e, perf 4001-7 ft, pump 176 bbls, 4075 ft.

LaSalle Parish: Trout—Hunter Co.'s Gross 1, se se 18-8n-3e, abnd 3700 ft.

Arkansas

Second Well at Midway 110 Feet Low on Discovery

Three fields shut down pending hearing; second well at Midway; Big Creek test shows water but later appears distillate producer.

The Arkansas Oil and Gas Commission last week ordered McKamie, Macedonia and Dorcheat fields to shut down at 7 a.m. February 27, until a hearing is held by the commission and a representative of the Petroleum Coordinator's office March 10, following which rules for production of the two fields will be announced. This week commission engineers will take bottom-hole pressures and secure other data to submit at the hearing. Both fields produce from Smackover lime. Four drilling permits were secured last week for Macedonia. Dorcheat has 40-acre and Macedonia 80-acre spacing.

Midway: Second producer in Midway

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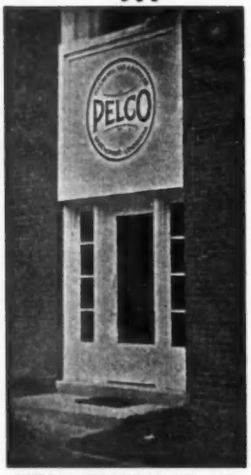

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field, LaFayette County, flowing into pits ungauged at Barnsdall's Dobson 2, SE NE 10-15-24, perforated 5½-in 6450-6500 ft with 200 shots; top porosity 6424 (elevation 282), low 110 ft on discovery well on top porosity and 60 ft low on top Buckner at 6230 ft. Is north offset to discovery well. Two other tests preparing to perforate: Barnsdall's Dobson 1, SW SW 11-15-24, total depth 6450 ft; top porosity 6417 (elevation 293), 92 ft low on porosity in discovery well; and Arkansas Fuel Oil Co.'s Creek 1, NE SE 10-15-24, to total depth 6494 ft; top porosity 6421 (elevation 269), 120 ft low on discovery well. Magnolia's J. A. Johnston 1, NW SW 11-15-24, checked so low operators ran geophone to 6564 ft, after failing to top porosity until 6537 ft. Eight other tests drilling, one shut down after rigging up.

Big Creek: J. W. Love's Stager 1, C NE 9-17-21, Columbia County, after flowing distillate and mud showed heavy salt water encroachment at 7985 ft and plugged back. Later after perforations at 7973-79 ft and again flowed distillate ungauged with tubing pressure 2600 pounds. Was last drilling operation in Columbia County.

COMPLETION

Little River County: Wildcat—A. Gatowsky's Mills 1, c sw sw sw 18-12s-29w, elev 320 ft, Tokio 665, Paluxy 1014, anhydrite 1948-2042, Travis Peak 2422, Eagle Mills 2934, paleozoic 2992, abnd 3660 ft.

Mississippi

COMPLETIONS

Yazoo County: Tinsley—Frankel Brothers' Barnes 5, nw se 1-9n-3e, Woodruff 4907-22 ft, pump 12 bbls hr, 4922 ft. W. B. Johnson and Texas' Hennis B-5, ne sw 36-10n-3w, Woodruff 4672-4712 ft, pump 17 bbls hr, 4758 ft. Slick-Urschel Oil Co., Slick 17, se 35-11n-3w, perf 5780-5810 ft, McGraw 5782-5808 ft, pump 300 bbls, 6081 ft; Slick 23, se ne 35-11n-3w, Perry 5285, Stevens 5370, McGraw 5790 ft, abnd 5812 ft.

Michigan

Saginaw County Well Swabs Oil From Traverse

Basin wildcat may make producer. Deepening helps first southwest-state producer-wildcat prospect of year. Record potential established in Reed City field.

Wildcats: Miller Brothers' Sutliff 1, SE SE SE 10-9n-1e, Saginaw County, carried 150 ft oil natural from Traverse lime at 2480 ft, top 2457 ft, and filled up 1835 ft after 30-quart shot. First attempt to acidize with 250 gas unsuccessful. Swabbed 76 bbls oil 39 hrs.

Southwest & Associated's Blackmer 1, NE SE NE 15-8n-14w, Ottawa County, drilled more pay when deepened from 1882 to 1885 ft; made several short flows and will be re-acidized. Before deepening, pumped 8 to 11 bbls day.

Shakespear Associate's Cadillac 1, W½ SE NE 35-23n-10w, Wexford County, logged Dundee 3739 ft, and set 5-in 3835 ft; Monroe lime at 3809 ft.

Reed City: Ohio Oil Co.'s Leusby 3 N½ NW SW 20-18n-10w, Osceola County, flowed 748 barrels oil first hour for rated 15,500 bbls from Monroe at 3666 ft.

COMPLETIONS

Allegan County: Wildcat—Bridger Basin Oil Corp.'s Armintrout 1, ne sw sw 34-2n-13w, Traverse lime 1365 ft, abnd 1409 ft. Earl H. Gromer's Barnard 1, sw se ne 33-1n-11w, Traverse 1277 ft, abnd 1292 ft. Roung & Clark's Merrian 1, sw se se 36-1n-14w, Traverse 1247 ft, abnd 1310 ft.

Allegan County: Trowbridge—John Burton's Waterman 1, ne ne ne 31-1n-13w, Traverse 1342-1355 ft, pump 48 bbls after acid, 10% water, td 1355 ft.

Arenac County: Adams—Ervin Major's Bryan 2, se nw sw 22-19n-3e, abnd 3010 ft.

Bay County: Kawkawlin—Gulf's Kaiser 1, s½ ne sw 1-14n-4e, Dundee 2721-2871 ft, flow 230 bbls 11 hrs after acid, td 2871 ft.

Clare County: Winterfield—McClanahan Oil Co.'s Barhite 1, e½ nw se 30-20n-6w, abnd 3850 ft.

Gladwin County: South Beaverton—Sun's Keller 3, e½ nw ne 35-17n-2w, Dundee lime 3840-62 ft, 2200 ft oil 26 hrs, acidized flow and pump 116 bbls 20 hrs, td 3885 ft.

Gladwin County: Buckeye—T. F. Caldwell's Emott 1, nw se nw 21-18n-1e, Dundee 3562 ft, pay 3638-43 ft, pump 22 bbls after acid, td 3650 ft.

Isabella County: Broomfield—W. P. Bole's Swan 1, c ne 1-14n-6w, Stray sand 1301 ft, sw 1335 ft, abnd 1338 ft.

Muskegon County: Wildcat — Jacob Bolema's Whitlock 1, e½ ne sw 34-10n-15w, abnd 2287 ft.

Osceola County: Reed City—Pure's Richard 2, n½ ne se 19-18n-10w, drilled Monroe lime 3553-3595 ft, flow 291 bbls 1st hr, td 3596 ft. Ohio's Leusby 3, n½ nw sw 20-18n-10w, Monroe 3660-66 ft, flow 187 bbls 1st 15 minutes, 250 lbs back pressure on 5-in, td 3666 ft. Gordon & Bolger's State G3, n½ se ne 29-18n-10w, Monroe 3500-35 ft, flow 709 bbls, td 3535 ft. Ohio's Jewett 1, n½ sw sw 32-18n-10w, Monroe 3560-90 ft, flow 404 bbls 1st hr, td 3596 ft.

Van Buren County: Bloomingdale — Mich. Devonian's Harbolt 1, nw sw sw 15-1s-14w, Traverse 1257 ft, abnd 1292 ft.

OLD WELL DRILLED DEEPER

Tuscola County: Akron — Elmer Brehm's Childs A1, sw sw sw 19-14n-8e, old td 3450 ft, Sylvania 3680 ft, abnd 3976 ft.

California

Wildcat Scheduled for West Belridge Area

Wildcat project scheduled for West Belridge area, Kern County; tests abandoned at Newhall-Castiac area and Rideout Heights-West Whittier area, Los Angeles County.

Kern County: Shell Oil Co. has graded location for Williams 45-6, a wildcat project 5 miles west of the south tip of the North Belridge field, Sec 6-28-20. Location is to west of company's Voight 1 wildcat which was taken to 4854 ft and tested wet on a shallow interval 1153-1479 ft.

Los Angeles County: Barnsdall Oil Co. abandoned Limbocker 1, wildcat in 17-3-16, Newhall-Castiac area, which was bottomed at 7056 ft. Upper sands cored tested wet and sand showing faint cuts at 6652-6713 ft were too tight, as was 32 ft of sand encountered in interval 4127-70 ft.

Bell View Oil Syndicate's No. P-1 wildcat, Sec 17-2-11, Rideout Heights-West Whittier area, bottomed at 1655 ft and plugged to 1270 ft, failed to show commercial production on bailing test, and is scheduled for abandonment.

COMPLETIONS

Fresno County: East Coalinga Eocene—Standard's 34-31B, 2350 ft s 2418 e nw c 31-31-19-16, flow 1681 bbls 48/64-in bean, 900/1100 lbs, 238 ft perf 8183 ft, td 8185 ft; 44-31B, 2332 ft s 2976 e nwc 31-19-16, flow 1857 bbls 36/64-in bean, 1000/1100 lbs, 180 ft perf 8168 ft, td 8170 ft; 54-31B, 2074 ft s 2448 w nec 31-19-16, flow 2531 bbls 56/64-in bean, 780/1050 lbs, 33 ft perf 8164 ft, td 8166 ft. Superior's Cagle B-11, 1060 ft n 1220 e w¼ cor 6-20-16, flow 1293 bbls 29/64 bean, 900/0 lbs, 177 ft perf 7353 ft, td 7714 ft.

Fresno County: Helm—Amerada's Weyant 5-27, 330 ft s 330 e w¼ cor 27-16-17, flow 254 bbls 15/64 bean, 350/0 lbs, perf 8100-8110 ft, Kreyenhagen 7500 ft, td 8500 ft.

Kern County: Canal—Shell's KCL A-44-14, 2317 ft s 2297 e nwc 14-30-25, flow 84 bbls 4 hrs, 26/64 bean, 200/0 lbs, perf 8385-8387 ft, td 13,400 ft, Stevens 8050 ft, Olcese 11,440 ft, top oil showings 12,650 ft.

Kern County: Coles Levee—Standard's KCL 20-11, 2360 ft s 2309 w nec 9-31-25. Flowed 825 bbls 45.3 gr, 42/64 bean, 1675/2175 lbs, 283 ft perf 8183 ft, td 8185 ft.

Kern County: Dyer Creek—Union's Villard 62-1, 990 ft s 1650 w nec 1-26-27, Vedder 2098 ft, abnd 2142 ft.

Kern County: Midway-Sunset — H&T Oil Co.'s No. 4, 340 ft n 1327 w sec n½ nw 15-31-25, pump 45 bbls, 280 ft perf 1224 ft, oil sand 951 ft, td 1224 ft.

Kern County: Mount Poso—D. D. Dunlap Oil Co.'s Lambert 1, 500 ft s 200 e nwc 29-26-28, Vedder 1804 ft, abnd 1829 ft.

Los Angeles County: Newhall — Barnsdall-Bandini-Ambassador Oil Co.'s Limbocker 1, 1371 ft s 2127 w nec 17-3-16, perf 2140-2160 ft, 1510-1530 ft, 1580-1630 ft, abnd 7056 ft.

Los Angeles County: Wilmington—Cleveland

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Orange County: Puente Nills-Turnbull Canyon—Continental's Turnbull Comm. 2, 1920 ft n 1785 w sec 13-2-11, flow 860 bbls 31/64 bean 110/410 lbs, perf 3268-3380, 3410-3535, 3610-3678 ft, base Conglomerate 1984 ft, top oil zone 3295 ft, td 3841 ft.

Orange County: West Whittier-Rideout Heights—Bell View Oil Syndicate's P 1, 250 ft n on e line lot 57 Citrus Heights from sec, thence 100 w, tested wet, 71 ft perf 1270 ft, bailed dry, perf 1110-1140, bailed dry, top gravel showing tar 1260 ft, abnd 1655 ft.

Santa Barbara County: Cat Canyon — Union's Bell 13, 330 ft s 330 e cent 27-9-33, pump 732 bbls 14 hrs, 649 ft, perf 6049 ft, td 6050 ft.

Sutter County: Rio Vista—Standard's Anderson 1, 272 ft n 267 w sec 2-3-2, flow 7800 mcf gas 32/64 bean; 1400/1366 lbs, 127 ft perf 4329 ft, Emigh shale 3797 ft, green sand 4228 ft, white sand 4323 ft, td 4370 ft.

Ventura County: Ventura Avenue—Shell's Shell-Lloyd A-1, 1510 ft n 12510 e c l No. 11, flow 2016 bbls 40/64 bean, 550-990 lbs, perf 10,005 - 10,060, 10,100 - 10,460, 10,827 - 10,946, 10,985-11,340, 11,381-11,516 ft, td 11,516 ft.

WILDCATS STARTED

Fresno County—Amerada Petroleum Corp.'s Clover 75-28, 28-16-17, Rig; Lawton 58-26, 26-17-29 lcn, and Leal 34-26, 26-17-19, lcn.

Kern County—Richfield's KCL 3, 36-11-20, lcn. Signal Petroleum Co.'s Loudon 1, 32-26-28, rigging; Signal Oil & Gas Co.'s Signal-Bishop 2, 22-27-28, lcn. Glide 23-1, 23-27-28, lcn.

Orange County—Midfield Petroleum Co.'s Cypress 1, 16-4-11, lcn. South Basin Oil Co.'s No. 103 24-3-9, lcn.

Eastern States

NEW YORK

COMPLETIONS

Allegany County—Messer Oil Co., Vosburg farm, Bolivar, 15 bbls, Richburg, td 1370 ft. South Bolivar Oil Co., McKelvey farm, Bolivar, 5 bbls, Richburg, td 1371 ft. Producers Oil Corp. A, Keller-Scott farm, Wirt, 5 bbls, Richburg, td 1052 ft. Ebenezer Oil Co., Vincent farm, Scio 8 bbls, Richburg, td 1060 ft. Hardy & McBride, Garthwaite farm, 8 bbls, Richburg, td 1325 ft. Albert Oil Co., Witter farm, Alma, 8 bbls, Richburg, td 1223 ft. Marsh Oil Co., Withey farm, Bolivar, 6 bbls, Richburg, td 1412 ft. L. H. Thornton et al, Smith farm, Willing, 7 bbls, Richburg, td 1259 ft. L. & D. Oil Co., Browning farm, Scio, 4 bbls, Scio, td 569 ft. New York Oil Co., Brown farm, Bolivar, 6 bbls, Waugh-Porter, td 1372 ft.

INTAKE WELLS

Messer Oil Co., Vosburg farm, Bolivar, Richburg, td 1380 ft. Bradley Prod. Corp., Nobles farm, Alma, Richburg, td 1364 ft. South Bolivar Oil Co., McKelvey farm, Bolivar, Richburg, td 1369 ft. Producers Oil Corp., A, Keller-Scott farm, Wirt, Richburg, td 1048 ft. Starr Oil Co., Neff farm, Wirt, Richburg, td 1246 ft. Bradley Prod. Corp., Rolls farm, Alma, Richburg, td 1363 ft. Criss Oil Co., Goldman farm, Alma, Richburg, td 1543 ft. Dick Oil Co., Bradley farm, Bolivar, Richburg, td 1411 ft. P. J. Shaughnessy et al, Daley farm, Alma, Richburg, td 1239 ft. Bliven Hill Oil Co., McEwen-Norton farm, Amity, Scio, td 850 ft. L. & D. Oil Co., Browning farm, Scio, td 558 ft. H. W. Patterson et al, Ockerman farm, Amity, Scio, td 729 ft.

OHIO

COMPLETIONS

Ashland County—Stewart et al, Long 1, 0.4 gas, td 2825 ft.

Coshocton County—Fred W. Abbott et al, Ashcraft 1, abnd 3190 ft.

Harrison County—Ohio Oil Co., Bursner 1, abnd 1214 ft.

Knox County—W. I. Booth, Cooksey 1, 0.04 gas, td 2969 ft. Gail Early et al, Hammon 1, 0.06 gas, td 760 ft. Upham Exploration Co., Cline 1, abnd 2969 ft.

Licking County—Allen Willey, Caldwell & Currie 2, 40 bbls, 3060 ft. Ohio Fuel, Heller 1, abnd 2624 ft.

Medina County—Ohio Fuel, Karasek 1, abnd 3378 ft. East Ohio Gas, Cleveland Trust Co. 1, 4.7 gas, 3217 ft.

Meigs County—H. M. Nelson, Gilchrist 1, 0.5 gas, td 639 ft. C. W. Nuzum, Gilkey 2, 1 bbl, td 232 ft. Downie et al, Gorley 1, abnd 800 ft.

Morgan County—Cowley et al, Smith 1, abnd 945 ft. Litton & Radford, Walker 1, abnd 4275 ft.

Muskingum County—Mehowa Oil & Gas, Offenbacher 2, 0.3 gas, td 4260 ft. Industrial Gas Corp., Stutes 3, abnd 4310 ft. Atha Co., Fisher 2, abnd 4045 ft.

Perry County—Preston Oil Co., Wilson 1, 14 bbls & 0.01 gas, 3288 ft. Clyde Foraker, Thomas 2, 4.12 gas, 3599 ft.

Stark County—Belden et al, Barber 1, 1.6 gas, 4819 ft.

Summit County—East Ohio, Hartong 1, 0.5 gas, 4453.

Washington County—Russel Hanlon et al, Allen 1, abnd 2149 ft. Lorentz Bros., Lorentz 6, 5 bbls, 931 ft.

PENNSYLVANIA

COMPLETIONS

Armstrong County—T. W. Phillips, Dunmire 3, 0.05 gas, td 3470 ft.

Clarion County—Owens Illinois, Miller 1, 0.15 gas, td 866 ft. Sedgewick & Crumb, Willison 1, 0.07 gas, td 2728 ft.

Greene County—H. D. Freeland et al, Kent heirs 1, 2.5 gas, td 2952 ft.

Washington County—Foley & Williams, Johnson 1, 0.23 gas, td 926 ft.

Westmoreland County—Peoples Natural Gas, Westmoreland Mining Co. 1, 0.04 gas, td 3900 ft.

OLD WELL DRILLED DEEPER

Armstrong County—T. E. Rosenstill & Son, Beck 1, 0.02 gas, td 1922 ft.

WEST VIRGINIA

COMPLETIONS

Boone County—Owens, Libby, Owens, Echols heirs 2, 0.1 gas, 2471 ft.

Cabel County—Cumberland Gas Co., Brady 1, 0.04 gas, 3290 ft.

Calhoun County—W. V. Knight, Ward 2, 1½ bbls, td 2141 ft. B. J. Crowley et al, Snyder 3, 40 bbls, td 2023 ft. Hope Natural, Gainer 8591, 2.48 gas, td 1683 ft. Va. Gasoline & Oil Co., Elliott 7, 12 bbls, td 2110 ft. McCall Drlg. Co., Gainer & Wigner 3, 0.27 gas, td 2158 ft.

Doddridge County—Coffman Oil & Gas, Ashcraft 1, abnd 2907 ft.

Gilmer County—Verle M. Stewart, Sourbourn 2, 0.25 gas, 1496 ft.

Jackson County—Columbian Carbon, Weekley 1, 0.86 gas, td 5098 ft. United Fuel Gas Co., Hutchinson 5070, 12.33 gas, td 5181 ft. United Carbon, Perkins 994, 5.41 gas, 5191 ft.

Kanawha County—G. L. Cabot, Higginbothem 1, 1.93 gas, td, 5166 ft, South Penn, Burdette 1, 1.1 gas, td 5178 ft.

Ritchie County—Hope Natural Gas, Nester 8589, 0.58 gas, td 1782 ft.

Upshur County—Pittsburgh & W. Va. Gas Co., Higginbottom 7844 ft, 0.23 gas, td 2726 ft.

New Mexico

COMPLETIONS

Eddy County—Aston & Fair's Hudson 4, sw nw nw 17-17s-31e, flow 52 bbl 2-in, shot 240 qts nitro 3381-3500 ft. Dixon & Yates' Saunders 5-A-X, ne sw ne 12-18s-27e, flow 864 bbl ¾-in, shot 100 qts 2739-68 ft. Sanders Bros. et al's Evans 2, c se ne 4-17s-30e, flow 60 bbl 2-in, shot 130 qts 2937-66 ft; Evans 3, c nw ne 4-17s-30e, flow 260 bbl 2-in, shot 110 qts 2937-70 ft. Skelly's Lea 2-B, c sw sw 23-17s-31e, flow 50 bbls 2-in, top pay 3485 ft, shot 720 qts 3314-3779 ft, td 3855 ft.

Lea County: Arrowhead—Gulf's State-Leonard 4-C, c nw nw 36-21s-36e, flow 267 bbl natural ½-in, 3740-3825 ft.

Lea County: Cooper—Continental et al's Vaughn 1-A-12, c sw nw 12-24s-36e, flow 132 bbl 37-gr oil ¾-in, shot 220 qts 3550-3680 ft.

Lea County: Wildcat—Richmond Drl Co. et al's State 1, c ne se 5-16s-38e, elev 3754 ft, anhydrite 2180 ft, salt 2245-3180 ft, Yates grains 3350 ft, brown lime 3400 ft, red sand 4120 ft, San Andres 4630 ft, abnd 5508 ft.

Lea County: Maljamar—Fair & Pope's Johns 1-A, c sw ne 26-17s-32e, flow 720 bbl 1-in, shot 120 qts 3940-4186 ft.

Lea County: Monument—B. H. Nolen et al's Cooper 3, nw sw nw 3-20s-37e, flow 415 bbl ¼-in, acid 4000 gals 3856-86 ft.

WILDCAT START

Eddy County—Neil H. Wills et al's Wills-Government 1, c nw sw 13-20s-28e.

Rocky Mountain Area

MONTANA

COMPLETION

Glacier County—Frances Oil Co.'s Tribal-201 2, cel se ne 30-32n-5w, Lower Cut Bank 2880-2911 ft, swab 95 bbls, 2923 ft.

WYOMING

COMPLETION

Niobrara County—Cow Gulch Oil Co.'s Nelson 1, c se sw 19-35n-65w, South Lance Creek wildcat, abnd 6550 ft.

Men In The Industry's News

TOM M. GIRDLER, chairman of the board, chief executive officer, and director of Republic Steel Corporation, will be guest of honor and principal dinner speaker at the American Petroleum Institute's Division of Production, Pacific Coast spring meeting, Tuesday, March 10, 1942, at the Biltmore Hotel, Los Angeles. Girdler also is head of Consolidated Aircraft Corporation, Vultee Aircraft, Inc., director of Aviation Corporation, New York, and director of Goodyear Tire & Rubber Company, Akron, Ohio. Bruce H. Robinson, division superintendent of General Petroleum Corporation, Los Angeles, will preside at the evening meeting.

E. E. ROBBINS, director of materials for District 2, Office of Petroleum Coordinator, discussed questions concerning the procurement and use of material under preference rating order P-98 and conservation order M-68 before the Petroleum Accountants Society at Tulsa, February 25. Other program speakers were R. W. Decker and Alden Coffey, both of Oklahoma Natural Gas Company.

L. W. STORM of Schlumberger Well Surveying Corporation, addressed the West Texas Geological Society at Midland on February 23, on "A Resume of Current Opinion on Larger Features of Gulf Coast Sedimentation."

ED. REID, Arrow Drilling Company superintendent, has been transferred from Illinois to Shawnee, Oklahoma.

GUY A. THOMPSON, vice president and general manager of Bethlehelm Supply Company, has returned to Tulsa after having served the procurement division of the War Production Board for the past six months.

PHIL DAVISS, Tidewater Associated Oil Company scout in the Wichita Falls area has been transferred to Oklahoma City.

MAX S. LOY, The Sloan and Zook Oil Company, has been transferred from west Texas to Chanute, Kansas, where he will superintend water-flood operations.

DAVE G. GRAY, executive vice president of the North Texas Oil & Gas Association the past four years and associated with oil interests in Wichita Falls since 1915, has resigned to become director of marketing for District No. 3, Office of Petroleum Coordinator, with headquarters at Houston.

J. E. BRANTLY, president of the American Association of Oilwell Drilling Contractors, will be the principal speaker at a joint meeting of the association and the Gulf Coast Section of the American Institute of Mining and Metallurgical Engineers March 3, River Oaks Country Club, Houston.

O. L. STURBOIS, Vincennes, was elected president of the newly-formed Indiana Oil and Gas Association, Inc., at a meeting in Vincennes, February 18. Other officers are: Fred Grimme, Indianapolis, first vice president; E. D. Harmon, Evansville, Papoose Oil Company, second vice president; E. J. Reading, Sun Oil Company, Evansville, treasurer. The purpose of the organization as adopted by the membership included "the obtaining and dissemination of reliable information in regard to oil operations, production and activities in Indiana fields."

DR. J. BRIAN EBY, consultant, and T. I. Harkins of Independent Exploration Company, presented a paper on "Geophysical History of Darrow Dome, Ascension Parish, Louisiana," before the Houston Geological Society February 26.

J. A. LYON, chief engineer in district three, Texas Railroad Commission, Houston, has resigned that position to open consulting offices in Houston. Lyon joined the commission June 10, 1937, at Austin, and has served at Pampa, Kilgore, Corpus Christi, Midland, and Austin. He was transferred to the Houston district February 10, 1939, and was made chief engineer in April, 1940. He is a graduate of Texas A. & M. College.

JOE F. CARPENTER, Shreveport district scout for Magnolia Petroleum Company, has reported for duty with the United States Coast Guard, and has been succeeded by J. F. McClung, formerly in the company's Great Bend, Kansas, land office.

C. P. PARSONS, vice president of Halliburton Oil Well Cementing Company, will be the main speaker at a joint meeting of the Mid-Continent section of the American Institute of Mining and Metallurgical Engineers and Tulsa University student chapter of A.I.M.E., March 4 at Tulsa.

J. L. JOPLIN has been appointed sales manager of Buda Engine & Equipment Company in the Houston office. J. T. McFarland is being transferred from Odessa to Wichita Falls, and will be in charge of North and West Texas. Frank Dalling, formerly located at Wichita Falls, is being transferred to Houston, and J. M. Bridges, formerly at Corpus Christi, goes to Odessa.

O. W. MALONEY who was elected president of Maloney Tank Manufacturing Company at a recent meeting. Other officers elected to direct the activities of the company are J. S. Warren, chairman of board and treasurer; J. C. Highfill, vice president and manager; C. M. Warren, secretary; T. J. Costello, sales manager; J. S. Warren, Jr., sales engineer, and in charge of government defense orders. The new president is the son of the founder, O. W. Maloney, Sr., who was instrumental in the firm's organization in 1909.

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PD-298 For Steel Plate Requirements. This form must be prepared in quadruplicate by Steel Plate Consumers and received by Producers and the Plate and Shape Unit, Iron and Steel Branch, War Production Board, Washington, D. C., on or before the first day of the month preceding the month in which shipment is required.

PD-299 For Steel Plate Consumption. No requests for steel plates covered by Form PD-298 will receive consideration unless this form is received by the Plate and Shape Unit, Iron and Steel Branch, War Production Board, Washington, D. C., on or before the seventh day following the close of the month reported.

PURCHASE ORDER FORMS CONTAINING STATEMENTS FOR COMPLIANCE UNDER ORDER P-98.

Gulf's regular purchase order Form 260, size 8½ x 11 in pads of 33 triplicate sets, printed in two colors and **now containing a short statement for compliance under Order P-98 will save you time in the preparation of orders under P-98.**

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Squeaks from the Bull Wheel

Interpreted

A Welsh regimental choir was singing outside the officers' mess after dinner.

The colonel called the unmusical sergeant-major.

"Look here," he said, "go and tell the choir to sing 'Sweet and Low.'"

The sergeant-major went out and bawled to the leader: "If you blokes can't make less noise the colonel says you've got to clear off."

Something

"In these hard times we should put a bridle on our appetites."

"I would rather put a bit in my mouth."

Think, Gentlemen, Think!

"Tell me, Professor Sage, what day of the month is it? For the life of me, I can't remember."

"It is the twentieth. And that reminds me, what month is it?"

Making It Easy

A man was giving some advice to his son. At the end of a rather stern lecture, he said: "Now, my boy, you understand perfectly what I mean?"

"Yes," replied the boy, "what it boils down to is this: If I do well, it's because of heredity, and if I fail, it's my own fault."

Where Credit Is Due

What is a rabbit?

It's an animal that grows the fur that other animals get credit for when it is made into a coat.

"Here's a story about a guy who offered his son $50,000 if he'd give up his bad habits."

"Yeah, and what would a guy do with $50,000 if he didn't have no bad habits?"

Right

"What's a Grecian urn?"

"That all depends on what he does."

Will Do It

"Have you forgotten that ten bucks I loaned you last week?"

"Not yet, give me time."

Peculiar Conversations

"Had you heard that Whatchacallit's daughter and Whosit's son—the boy that's in the army—were married the other day?"

"Yes, but this is the first time I've heard the real details."

Identified

During a shortage of flashlights an officer was doing the rounds of the camp one dark night.

He approached one sentry and flashed his light on him, but received no challenge.

"Why didn't you challenge me, sentry?" he demanded curtly.

"Well, sir, I recognized you,"

"How could you recognize me on such a dark night?"

"I heard the sergeant tell the corporal there was only one battery in camp and the orderly officer had pinched it."

Inheritance

A private, walking through the park with his girl, met his sergeant.

"This is my sister,"he explained, bashfully.

"That's all right," the sergeant replied kindly. "She used to be mine."

Symptoms

Cheer up; you might have something worse than gout.

I can assure you I'm not kicking.

Giving Him Time

"But I can't pay you for this suit for three months."

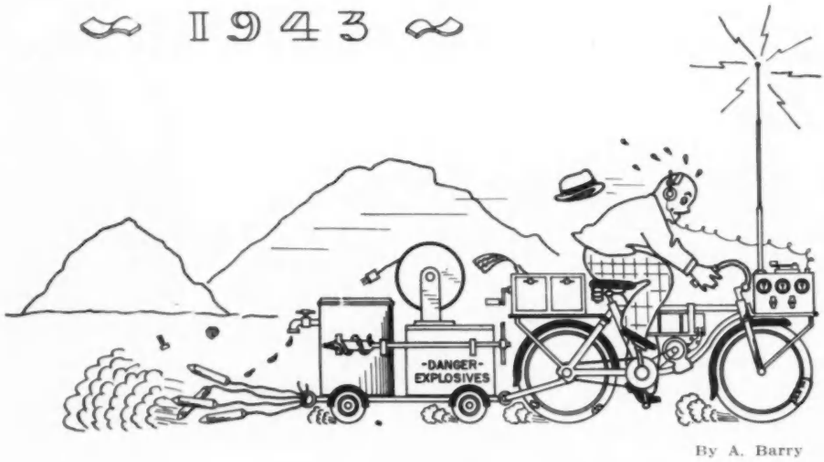
"Oh, that's all right. Don't worry about that."

"Well, thanks. When will it be ready?"

"In about three months."

SEISMIC PROSPECTING

1943



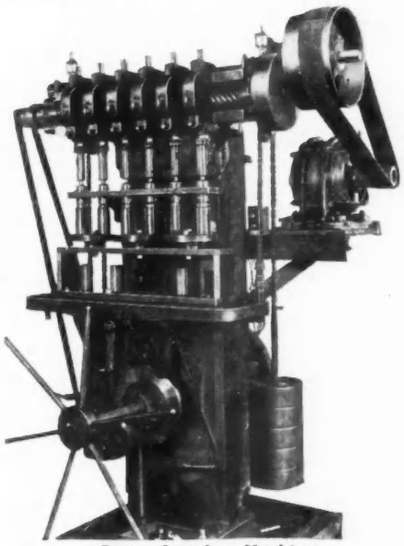
By A. Barry

Notes for the Equipment Buyer and User

Lapping Machine

EMSCO DERRICK & EQUIPMENT COMPANY

The new automatic coupling lapping machine, recently introduced by the D+B Division of Emsco Derrick and Equipment Company is designed to impart a greater degree of accuracy to the faces of D+B sucker-rod couplings.



Emsco Lapping Machine

This new lapping process is an additional operation and does not replace any of the former steps for trueing coupling faces. The coupling faces are precision ground, as before, but are extra processed in the lapping machine. This finishes them with the high degree of accuracy so necessary for the economical and efficient operation of the rod string.

Lapping assures perfect smoothness on the coupling faces. Uniform contact between the coupling faces and the shoulder of the sucker rod pins makes a more positive joint and better alignment of the entire rod string. Pin failures due to eccentric loading are eliminated and a friction locking effect reduces the possibility of unscrewing.

Rotary Mud Gun

PATTERSON-BALLAGH CORPORATION

As an improvement of its safety mud gun, engineers of Patterson-Ballagh Corporation have added a safety latch and have streamlined the flow of mud through the gun to eliminate an abrupt curve. The improved gun has a long swing ell and its main casting is of heavy steel. A locking ring provides for vertical adjustment. A new spring latch permits horizontal locking without the necessity of unbolting. This gun can be equipped with an extended pipe and a rubber nozzle.

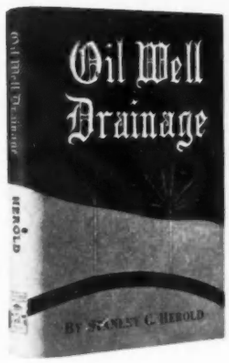
Patterson-Ballagh Mud Gun

H. C. Price Heads Industrial Engineering

H. C. Price, Bartlesville, is new president of Industrial Engineering Company, in a change in the administrative organization of the company. Other officers are W. W. Colley, Houston, vice president and general manager; K. H. Dyer, Wilmington, Cal., Pacific Coast manager. S. D. Bechtel, San Francisco, is chairman of the board; K. K. Bechtel, San Francisco, vice president and treasurer; W. E. Waste, Los Angeles, secre-

OIL WELL DRAINAGE

By STANLEY C. HEROLD



Oil Well Drainage is a practical book written in an easily readable style, fully supported by actual citations of field examples, expressly for geologists, engineers, landowners, and operators of producing oil and gas properties, for they meet directly the financial issues of the industry. It is confined to the problem with which they are primarily concerned—drainage.

Oil Well Drainage is planned for maximum reference value. Each chapter is divided into two parts, one each for two types of wells with distinct features in drainage. In the outer margin of each page the subject content of the paragraphs is indicated, so that it is possible to locate in a minimum of time the particular information wanted.

Contents: Introduction; Typical Artificial Reservoirs; Natural Reservoirs; Reservoir Energy; Function of Gas; Radius and Area of Drainage; Regional Drainage and Water Encroachment; Drainage Across Property Lines; Effects of Stratigraphy and Structure on Drainage; Effects of Reservoir Penetration on Drainage; Effects of Multiple Zones on Drainage; Effects of Rates of Production on Drainage; Effects of Field Development on Drainage; Drainage by Wells of All or No Gas; Injection of Gas, Water, or Oil; Reservoir Content, Ultimate Recovery and Reserves; Abandoned Oil and Gas; Curtailment, Proration, and Conservation; Conclusion.

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POSSIBLE FUTURE OIL PROVINCES *of the* UNITED STATES AND CANADA

A symposium conducted by the Research Committee of The American Association of Petroleum Geologists, A. I. Levorsen, chairman. Papers read at the Twenty-sixth Annual Meeting of the Association, at Houston, Texas, April 1, 1941, and reprinted from the Association Bulletin, August, 1941.

•

Edited by A. I. LEVORSEN

•

The purpose of this symposium is to get an over-all picture of the undiscovered oil resources of North America, north of the Rio Grande. Ten geological organizations have participated, to the end that this survey has behind it the authority of many geologists representing state and national geological surveys, large and small oil companies, and consulting and independent geologists. A map and a section of geology, stratigraphy, and structure illustrate each province description.

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tary. Directors are Henry J. Kaiser and G. G. Sherwood, both of Oakland, in addition to the principal officers. Offices are maintained at Houston, Wilmington, Bartlesville, and San Francisco.

Price is the head of H. C. Price Company, Bartlesville, Oklahoma. Colley has been associated with Industrial Engineering Company for many years, both in California and Texas. Dyer was associated with Industrial Engineering Company in its early days. S. D. Bechtel and K. K. Bechtel are executives of W. A. Bechtel Company, engineers and contractors, of San Francisco. Waste is administrative manager of California Shipbuilding Corporation, Wilmington, California. Kaiser and Sherwood are of the Henry J. Kaiser Company, Oakland.

E. D. Bullard Company Moves Office Locations

E. D. Bullard Company, announces its Los Angeles and Denver offices have moved to larger quarters in the same cities. The Los Angeles office, managed by Alton A. Castle, is at 1213 South Olive. In Denver, the office is at 56 Wazee Market. Tom Hallinan is in charge.

Pomona Pump Company Acquires Westco

Pomona Pump Company, manufacturers of vertical pumps, has announced the purchase of the Westco Pump Division of Micro-Westco, Inc., Bettendorf, Iowa. The newly acquired business will be operated as Pomona Pump Company, Westco Division, at 2621 Locust Street, St. Louis, Missouri, and manufacture continued from the St. Louis plant of the Pomona Pump Company. Management and key personnel of Westco will be transferred to St. Louis to continue the manufacture and distribution of the complete line of Westco pumps through the same national organization which has been built up by Westco over the past 16 years.

Addition of the Westco turbine pump for industrial and marine application, also boiler-feed and condensation units, side-suction centrifugals, complete water systems, line and cellar drainers, rounds out the line of Pomona deep well, low lift, industrial, marine and municipal pumps. During the last few years Pomona has added the Little Chief turbine pump and also Pomona deep and shallow well jets.

Rotary Line

The Wire Rope Division of the Jones & Laughlin Steel Corporation has recently published a useful booklet entitled "Rotary Line Service Record." This booklet was prepared for oil drillers and contractors for the convenience of keeping a service record on the wire rope they use. Charts are included to assist in determining the ton-miles of wire rope service that result from trips in drilling operations and in setting casing or running tubing.

Water Pumps

Chain Belt Company, Milwaukee, has issued a catalog illustrating and describing the line of Rex centrifugal water pumps for 1942. Included is detailed information and specifications concerning the design and manufacture of these pumps, together with data on how to pick a pump for a specific job.

Advertisers' Index

In the following index is shown only the advertisers having advertisements in this issue.

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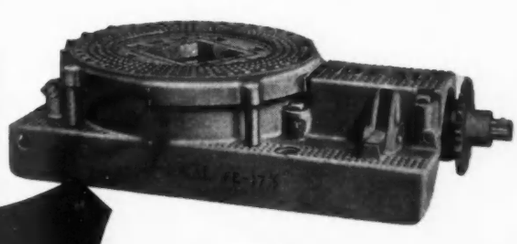

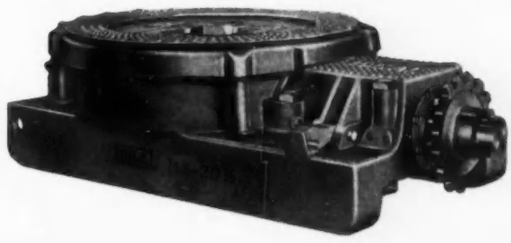

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IDEAL MS-20½ Rotary Machine

The Type MS-20½ is National's machine for speeds up to 350 r.p.m. at any depth. Feeling the need for a heavy duty rotary machine to reach, maximum depths, we have incorporated in the MS-20½ features of both heavier and higher speed rotaries, namely, the Types MS-27½ and SHS-20½.

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LET'S GO! U.S.A. KEEP 'EM FLYING!

LIKE the "stitch in time," the right tool at hand can often be the means of averting a disabling drill-rig break, or of making a repair in a fraction of the time that might otherwise be required.

In files, ***"right"*** means, first of all, good-quality files . . . files made of uniformly fine steel, with uniformly accurate cut and uniformly correct hardness. There'll be no "ifs," "buts" or doubts on any of these points if your choice is Nicholson or Black Diamond Files. ***"Right"*** further means having ***The right file for the job*** — in kind, cut and size. The Nicholson variety exceeds 3000.

Regular Mill (single-cut), Flat (double-cut) and Slim Taper (triangular) files should be in every oil-industry tool kit or repair shop. Some special-purpose files — for stainless steel, brass, aluminum, foundry-casting, and die-cast parts, for instance — are valuable standbys.

Each Nicholson or Black Diamond special-purpose file has special features toward best results and accuracy on the jobs or metals for which it is designed. These files are well worth the small extra detail or cost of keeping them on hand. Your mill-supply or equipment house can help you choose the files you need for your particular requirements.

FOUNDRY FILE — For the rougher filing jobs — on heavy pipe and castings, structural work, high shop welds, etc.—the rugged Foundry file shown here is invaluable. Its sturdy teeth (stronger than in ordinary double-cut files) can "stand the gaff" because they can resist shelling or breaking out.

NICHOLSON FILE COMPANY • PROVIDENCE, R. I., U. S. A.

(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON U.S.A. TRADE MARK MADE IN U.S.A.

Nicholson and Black Diamond Files

FOR EVERY PURPOSE

BLACK DIAMOND TRADE MARK

SHOES MAY COME AND SHOES MAY GO–

but the BAKER CEMENT WASH-DOWN WHIRLER FLOAT SHOE is

still your best bet to insure successful cementing

Before the time comes to land and cement casing, it is highly important to know that the guiding, floating and cementing equipment you intend to use will perform these three vital operations . . .

1. Land your casing safely;
2. Cement it efficiently;
3. Drill out easily.

Any equipment that does not provide *all three* of these features is not good enough to use in your well—you must have 3-Point Balance to do that cementing job *right the first time.*

Only one shoe can be BEST

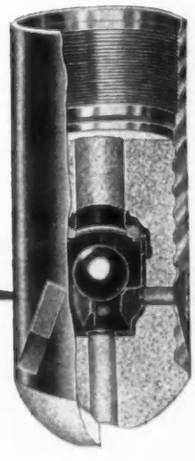
Mere words will not prove any product to be the BEST of its kind, but when thousands of cementing jobs have been successfully completed, many under conditions where other shoes have failed, the results clearly brand as BEST the Baker Cement Wash-Down Whirler Float Shoe.

This shoe is the logical outcome of many years experience in designing equipment for guiding, floating and cementing casing—proving such equipment satisfactory for the needs of that period—and constantly improving it to meet changing conditions and to provide greater efficiency.

Here are FACTS you should know

THREADED CONNECTION FURNISHED TO FIT ANY TYPE CASING. Baker Floating Units can be furnished with threaded connection to fit the specifications of your casing. (Float collars can be furnished with both "female" and "male and female" threaded connections.) Manufacturing precision assures thread uniformity and accuracy.

AMPLE STRENGTH. The seamless steel casing shoe into which the concrete plug and Plastic BALL-TYPE Valve Assembly are securely anchored provides a unit that has STRENGTH to float the longest and heaviest string of casing with an ample factor of SAFETY.



POSITIVE, LEAK-PROOF BACK-PRESSURE VALVE. The buoyant Plastic BALL-TYPE Back-Pressure Valve floats in the cement slurry or rotary mud and instantly forms a leak-proof double seal against a narrow, tough rubber ring (backed by Plastic and concrete) at the slightest reversal of pressure. Here is Valve Efficiency at its best.

AMPLE CIRCULATION AREAS. The correctly designed, streamlined Valve Assembly provides passageways ample for any circulating or cementing operation . . . a fact attested to by actual field performance under the most severe operating conditions.

BAFFLED WHIRLER PORTS. These whirler ports provide the important wash-down whirler action so advantageous in circulating and cementing operations. When the fluid strikes these baffled ports, a downward and then an upward whirling motion results. In running in, this whirling action provides a means of effectively washing away bridges. During cementing, the whirling action, imparted first to the fluid preceding the slurry and then to the slurry itself, properly prepares the hole to receive the cement. It then assures best possible distribution of a uniform body of cement around the shoe and the shoe joint, reducing the hazard of channeling to a minimum. Here is the ultimate in cementing efficiency.

EASY DRILLABILITY. Complete and easy drillability results from the internal construction of Baker-Formula Concrete and Plastic . . . the Plastic BALL-TYPE Valve Assembly being set on end in the concrete plug to present a minimum cross-sectional area to the drilling bit. The concrete and the Plastic are quickly and easily drilled up and circulated out of the hole. For complete details concerning Baker Cement Whirler Equipment, contact the nearest Baker office or field representative; or refer to Pages 227 to 229 of the 1942 Baker (or Composite) Catalog.

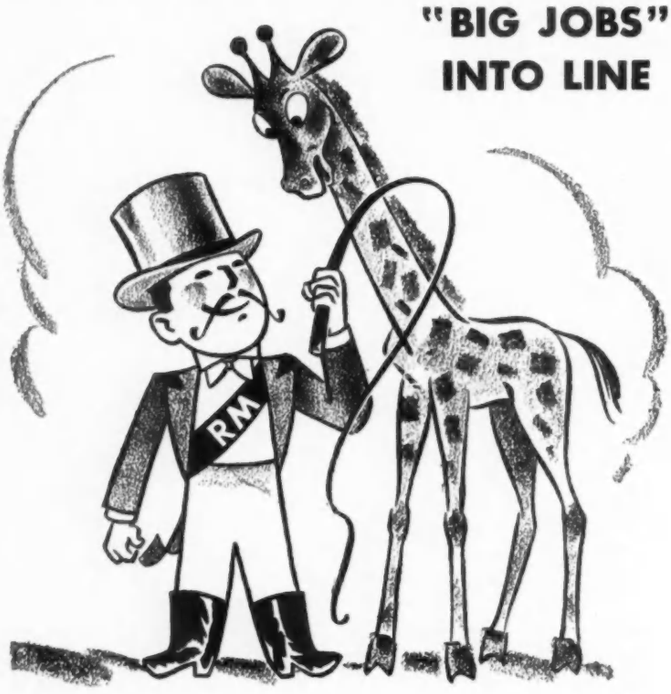
BAKER OIL TOOLS, INC.

MAIN OFFICE AND FACTORY:
6000 South Boyle Ave.
P. O. Box 127, Vernon Station, Los Angeles, Calif.

CENTRAL DIVISION OFFICE AND FACTORY:
6023 Navigation Boulevard
P. O. Box 3048 Houston, Texas
EXPORT SALES OFFICE:
19 Rector Street, New York, N. Y.

BUY UNITED STATES DEFENSE SAVINGS BONDS AND STAMPS

R/M PACKINGS WHIP THE "BIG JOBS" INTO LINE



Wherever air or water, gas or oil, steam or chemicals must be controlled for U. S. war production, R/M packings are "doing a job". They're *proving* their efficiency, endurance, and dependability by preventing breakdowns and maintaining top speeds.

Now—when machines are strained to the utmost and pressures are increased—when every ounce of energy is needed to boost production—R/M packings are answering the call to arm America. They can solve *your* production problem, too.

Write for the R/M catalogue on your business letterhead or ask your jobber for it. Streamlined for efficiency, R/M is the most complete and compact line available.

INDUSTRIAL SALES DIVISION
RAYBESTOS-MANHATTAN, INC.
MANHEIM, PA.
BRIDGEPORT, CONN. NORTH CHARLESTON, S. C. PASSAIC, N. J.
Makers of Packings for Every Industrial Use

LOOKING AHEAD

. . . with the Editor

Centralized Pumping Plant Lowers Costs

With a total of 36 wells so far drilled, of which 14 are being hydraulically pumped, with additional wells going on the pump as they reach the end of their flowing stage, a lease in California is now reflecting, in lower production costs and other savings, the advantages to be gained through long-range lease planning and unitization of all development and production operations.

Long before drilling was started, the lease was laid out in a row pattern, and the gathering line system, following the same pattern, was designed so that the same lines used in transporting drilling mud, fuel, oil and water to the drilling wells, could be converted into use as the lease gathering system, with ample flexibility for segregating the several types and grades of crude that are produced from the several zones open to production.

In addition to the efficient gathering system, which, incidentally does not include any small gauge tanks, the company has installed a centrally located 3-unit hydraulic pumping plant that pumps the 14 wells on artificial lift. Low cost maintenance and efficient operation of this plant is due in a large measure to a specially designed combination power oil and heat exchanger storage tank that utilizes engine water heat to heat the oil, and at the same time in so doing, cools the engine circulating water. The system is provided with a means whereby any degree of heating or cooling is possible merely by the turning of valves to divert the flow of engine water through various parts of the system.

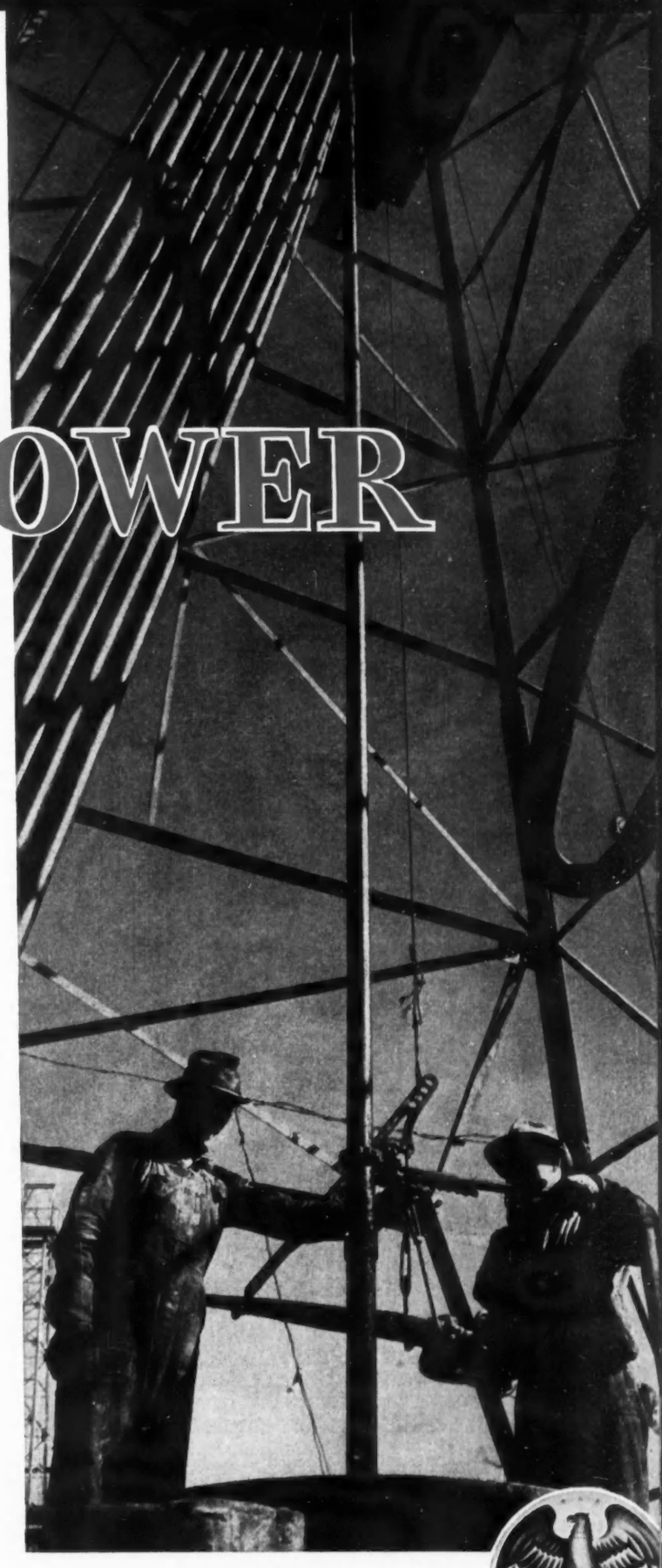
Further details, including numerous photographs, of this efficiently laid-out field set-up, will appear in an article to be published in an early issue.

★ KEEP 'EM PRODUCING ★

THE OIL WEEKLY. Published every Monday. Entered as second class mail matter December 23, 1916, at the post office at Houston, Texas, under act of March 3, 1879.

Tapping the Earth's Storehouse of

WAR POWER



Plans for a two-ocean navy, the world's greatest air force, more and more tank divisions and motorized field equipment for an army of millions of men—all emphasize the need for Oil in enormous gallonage. For without it, not a ship could ply the seas, not a plane could fly, not a tank would roll, not a truck could move.

And without Steel, not a drop of Oil could be produced.

Tons and tons of casing and tubing will be needed to siphon more millions of gallons of oil from its subterranean fields. It will be made of Steel—just as drill bits, line pipe, storage tanks and refining equipment are made of Steel.

Republic—world leader in production of electric weld casing, tubing and line pipe, of alloy and stainless steel—has stepped up its steel output many times over former peaks. It has greatly increased its facilities to insure *Production for Victory*—even now is making and planning additional expansion. Every one of its 71,000 men in 65 plants and mines is exerting full-out effort to supply the Steel you need to produce Oil, so vital to our war power.

Get a word and picture demonstration of the exclusive processes used in fabricating Republic Electric Weld Casing, Tubing and Line Pipe and their advantages. Ask for a copy of "The Pipe of Progress," a handsome, informative 44-page bound volume. Do it now.

REPUBLIC STEEL CORPORATION
General Offices: Cleveland, Ohio

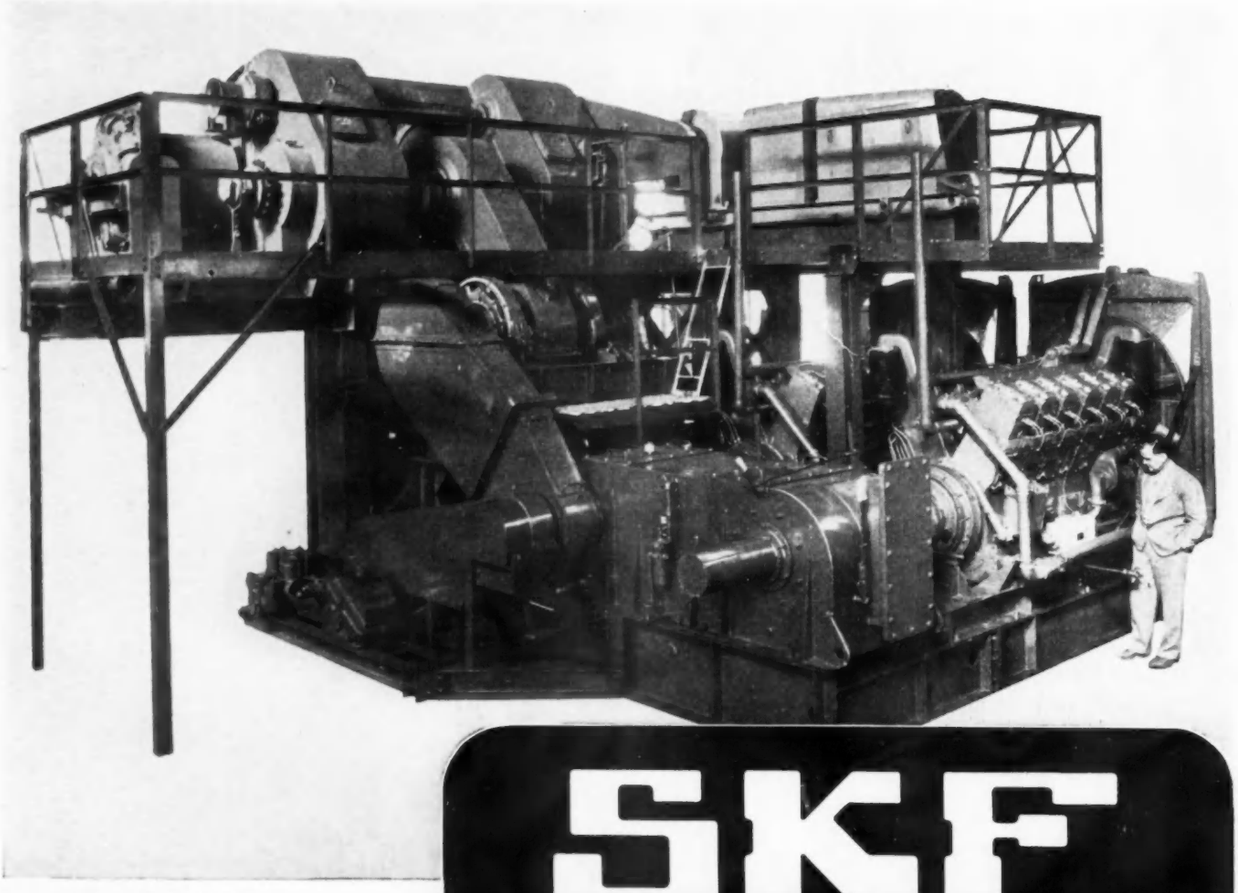
Howard Supply Company • Republic Supply Company
Los Angeles, California • Houston, Texas
Berger Manufacturing Division • Culvert Division
Niles Steel Products Division • Steel and Tubes Division
Union Drawn Steel Division • Truscon Steel Company

REPUBLIC *Electric Weld*

REPUBLIC STEEL
PRODUCTION FOR VICTORY

LINE PIPE...NORMALIZED CASING AND TUBING

Other products include Sheets and Plates—Upson Bolts, Studs, Nuts and Rivets—Electrunite Heat Exchanger Tubes.



BUILT BY EMSCO
DERRICK & EQUIPMENT CO.

SKF

BALL AND ROLLER BEARINGS

Big MACHINES *need* SKF

Here's one of those giant SKF-equipped Drilling Plants that help produce oil for thirsty airplanes, battleships, tanks, jeeps, etc. It's three stories high, with eight SKF Spherical Roller Bearings on the transmission, and three SKF's on outboard locations. The reason why SKF's were used is because their inherent aligning characteristics insure full load carrying capacity for useful work at all times by compensating for shaft deflections, distortions or weave without binding. And *that's* the reason why SKF's have been used for years on compressors, countershafts, crown blocks, draw-works, drilling rigs, drives, engines, hoisting drums, pitmans, pumps, rotary tables, screens, sheaves, spudders, swivels, traveling blocks, and winches. A machine that's SKF-equipped is built for PERFORMANCE.

4987

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILADELPHIA, PA.

Other products include Sheets and Plates—Upson Bolts, Studs, Nuts and Rivets—Electrunite Heat Exchanger Tubes.

BALDWIN CHAINS TRANSMIT ALL THE POWER

You don't see this very often!

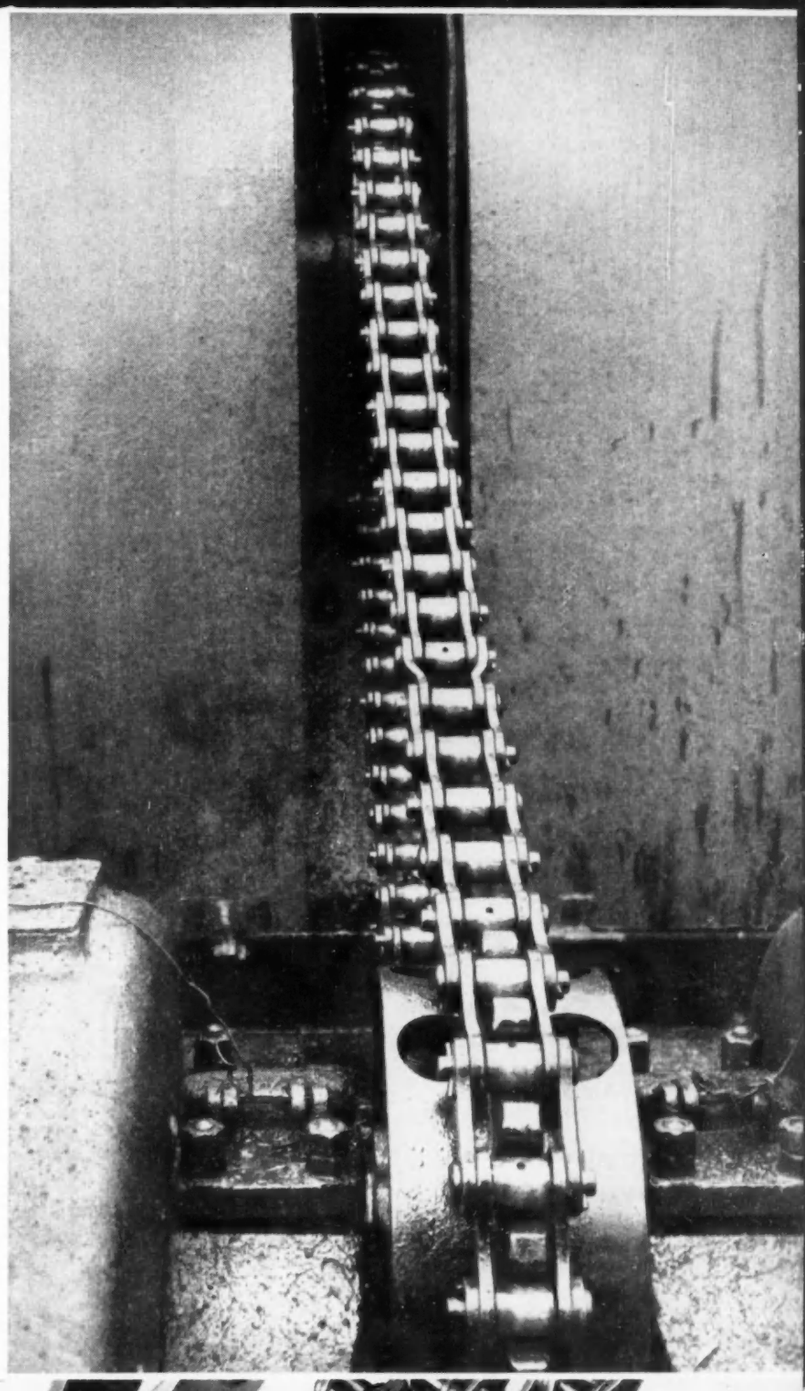
IT'S seldom that you see a Baldwin oil field chain in this still-life pose. For, on the job, Baldwin chains lead lives of action . . . running smoothly, quietly and efficiently . . . standing up under the toughest going . . . delivering *all* the power *all* the time.

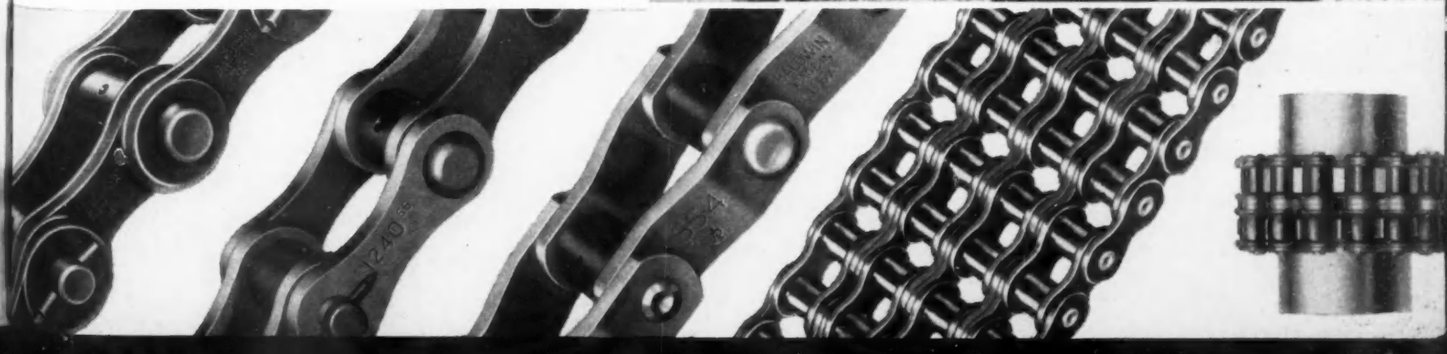
So we couldn't say when you might see Baldwin chains at rest in the oil fields. But if you're looking for a sure-fire way to lower cost per foot of hole, we advise you to see them—at your nearest oil field supply store. We further suggest that you use them on your own rigs and see for yourself why they are so often the first choice of experienced drillers everywhere. There's a size and type of Baldwin rotary chain for your every drilling need, and a Baldwin roller chain for most mechanical equipment needs.

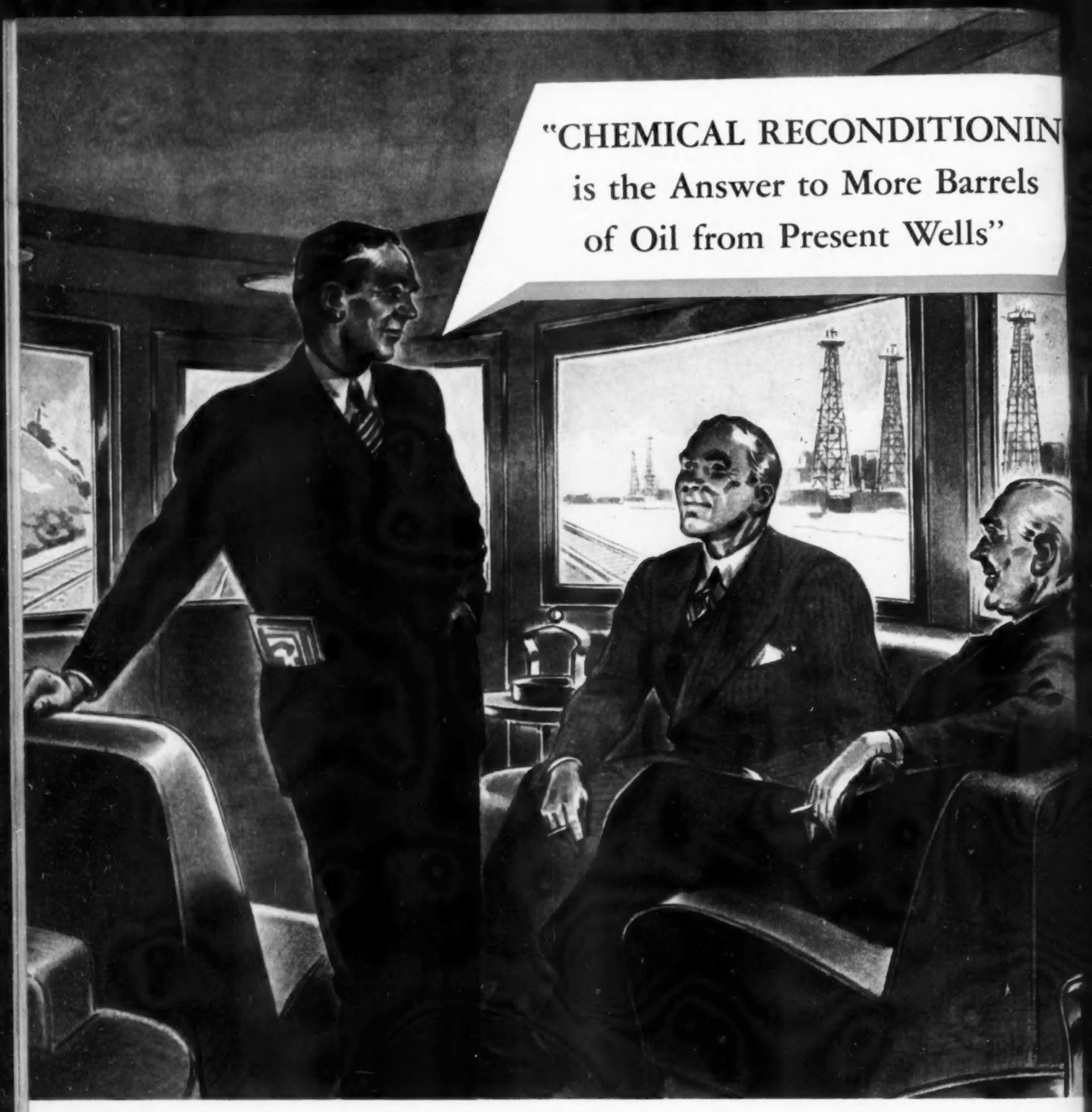
For Sale in All Oil Fields

BALDWIN-DUCKWORTH

Division of Chain Belt Company
341 Plainfield Street, Springfield, Mass.
Factories at Springfield and Worcester, Mass.



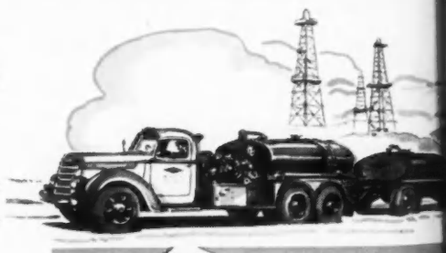




THERE IS NO QUESTION about the importance of Reconditioning these days. Even during normal times wells were reworked, as a good business practice, to boost production . . . now Reconditioning becomes a subject of much greater prominence.

Today the practice of producing every possible drop of oil has become an economic *necessity*. The bulk of this production must come from present wells—wells that have been *made* to produce more oil through an intelligent Reconditioning program.

Dowell Incorporated has developed and is now offering a program of Chemical Reconditioning Services which conserves manpower, materials and precious time—it is actually producing more barrels of oil.



Look to

DOWELL

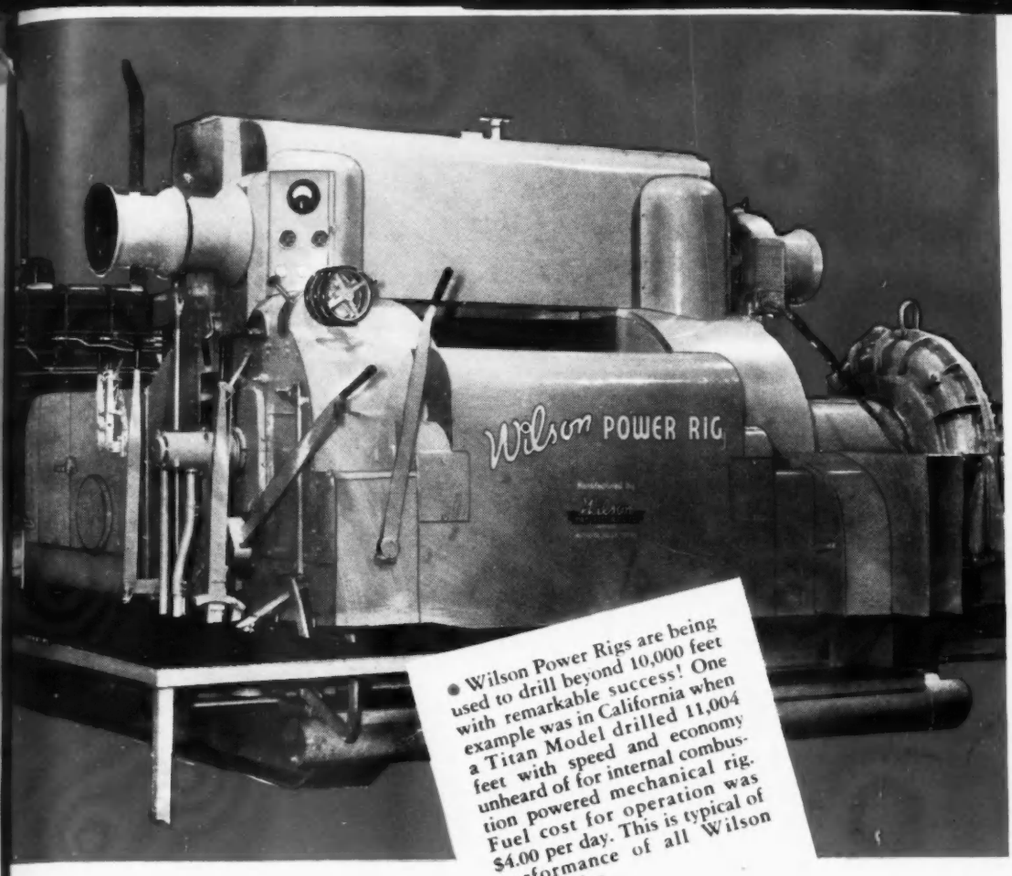
FOR OIL AND GAS WELL
CHEMICAL SERVICE

DOWELL INCORPORATED

Executive Office: MIDLAND, MICHIGAN — *General Office:* KENNEDY BUILDING, TULSA, OKLAHOMA

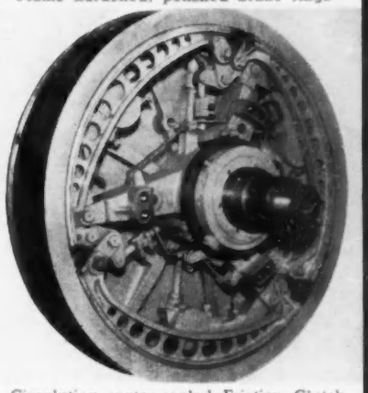
Subsidiary of The Dow Chemical Company

Subsidiary of The Dow Chemical Company

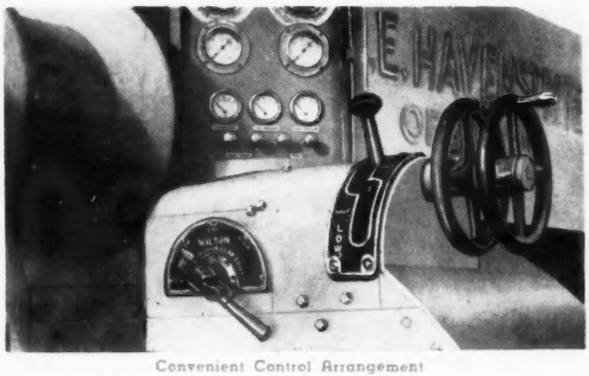


● Wilson Power Rigs are being used to drill beyond 10,000 feet with remarkable success! One example was in California when a Titan Model drilled 11,004 feet with speed and economy unheard of for internal combustion powered mechanical rig. Fuel cost for operation was $4.00 per day. This is typical of performance of all Wilson Power Rigs.

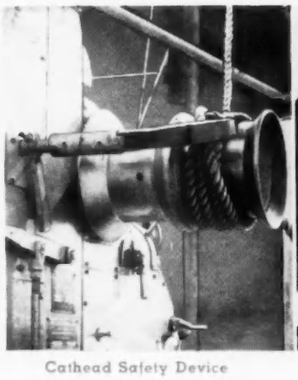
Flame hardened, polished brake rings



Circulating water-cooled Friction Clutch



Convenient Control Arrangement



Cathead Safety Device

Air Controlled Chain Drive Transmission

RIGS, LIKE TIRES, MUST LAST LONGER

SO SPECIFY *WILSON* WITH *15* EXCLUSIVE FEATURES!

Like the rubber on your car, a rugged, powerful, smooth operating rig impressively reflects its superior qualities when put to the endurance imposed on it, these days.

Under such circumstances, Wilson Power Rigs always prove their fullest value when the advantages of speed, power, ease of operation combine with low cost for repairs, maintenance, and fuel consumption.

15 exclusive Wilson features contribute to the outstanding performance of Wilson Power Rigs. Few of them are illustrated above. These many improvements unite to provide a service that has virtually revolutionized drilling of wells of any depth, size, formation and locality.

Check them from any angle and you'll learn that Wilson Rigs are the standard for efficiency and economy when compared with drilling equipment of any type and cost.

See complete specifications in Drilling Equipment Directory or Composite Catalog

Wilson MANUFACTURING COMPANY, INC.

WICHITA FALLS, TEXAS

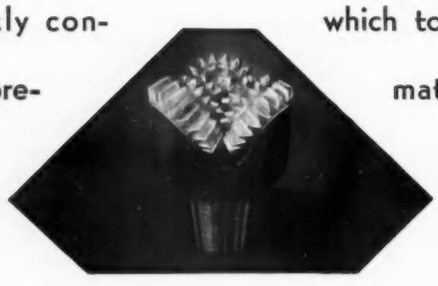
EXPORT REPRESENTATIVE
Guy E. Daniels
30 Rockefeller Plaza, New York City

PACIFIC COAST DISTRIBUTOR
H. & B. Sales Co., Ltd.
Long Beach, California

"Flying Ferry" — Photo by U. S. Army Signal Corps

A "bit" of good engineering . . .

When rivers must be crossed, Army Engineers "keep 'em rolling" with "Flying Ferries," quickly constructed from especially prepared material. ¶ More than thirty years of engineering and research are "built in" Hughes Tailor-Made Rock Bits . . . Bits which today are saving time and material in drilling for the oil needed to "keep 'em rolling." . . .



Hughes Tool Co., Houston, Texas

Wilson

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